

PENGEMBANGAN APLIKASI MOBILE DENGAN MENGINTEGRASIKAN MODEL SSD MOBILENETV2 UNTUK KLASIFIKASI SAMPAH ANORGANIK

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ABSTRAK

Pengelolaan sampah anorganik di Indonesia masih menghadapi berbagai kendala, terutama pada proses pemilahan yang umumnya dilakukan secara manual sehingga kurang efisien dan berpotensi menimbulkan kesalahan klasifikasi. Penelitian ini bertujuan mengembangkan aplikasi mobile berbasis Android yang mengintegrasikan model SSD MobileNetV2 untuk mendeteksi, mengklasifikasikan, dan menghitung jumlah sampah plastik serta kaca secara *real-time*. Metode penelitian yang digunakan adalah Research and Development (R&D) dengan pendekatan kuantitatif. Dataset terdiri atas 1.000 citra yang dibagi menjadi data latih (80%) dan data uji (20%), kemudian melalui tahapan *preprocessing*, augmentasi, pelatihan model, evaluasi, konversi ke format TensorFlow Lite, serta integrasi ke aplikasi Android yang dikembangkan menggunakan Kotlin dengan arsitektur MVVM dan penyimpanan lokal SQLite. Evaluasi model menggunakan metrik *accuracy*, *precision*, *recall*, *F1-score*, dan *mean Average Precision* (mAP), sedangkan aplikasi diuji menggunakan *Black Box Testing* dan *System Usability Scale* (SUS). Hasil penelitian menunjukkan bahwa model memperoleh *accuracy* sebesar 89,90%, *precision* 90,00%, *recall* 90,00%, *F1-score* 90,00%, dan *mAP* 95,88%, yang menunjukkan kemampuan deteksi objek yang baik. Seluruh pengujian fungsional aplikasi berhasil dijalankan sesuai kebutuhan sistem, sedangkan pengujian usability terhadap 33 responden menghasilkan skor SUS rata-rata 76,89, yang menunjukkan aplikasi berada pada kategori Good dan dapat diterima oleh pengguna. Dengan demikian, aplikasi yang dikembangkan mampu menjadi solusi yang efektif untuk membantu proses klasifikasi dan penghitungan sampah anorganik secara otomatis pada perangkat mobile.

Kata Kunci: SSD MobileNetV2, TensorFlow Lite, deteksi objek, klasifikasi sampah anorganik, aplikasi mobile, Android

DEVELOPMENT OF A MOBILE APPLICATION BY INTEGRATING THE SSD MOBILENETV2 MODEL FOR INORGANIC WASTE CLASSIFICATION

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ABSTRACT

Inorganic waste management in Indonesia continues to face various challenges, particularly in the waste sorting process, which is generally performed manually, resulting in low efficiency and a high risk of classification errors. This study aims to develop an Android-based mobile application that integrates the SSD MobileNetV2 model to detect, classify, and count plastic and glass waste in real time. The research employed a quantitative Research and Development (R&D) approach. The dataset consisted of 1,000 images, which were divided into training data (80%) and testing data (20%). The development process included data preprocessing, augmentation, model training, model evaluation, TensorFlow Lite conversion, and integration into an Android application developed using Kotlin with the Model3View3ViewModel (MVVM) architecture and SQLite local storage. Model performance was evaluated using accuracy, precision, recall, F1-score, and mean Average Precision (mAP), while the application was evaluated through Black Box Testing and the System Usability Scale (SUS). The experimental results showed that the proposed model achieved an accuracy of 89.90%, precision of 90.00%, recall of 90.00%, F1-score of 90.00%, and mAP of 95.88%, indicating strong object detection performance. Furthermore, all functional tests were successfully completed according to the system requirements. The usability evaluation involving 33 respondents produced an average SUS score of 76.89, indicating that the application falls into the Good category and is acceptable to users. Therefore, the developed application provides an effective solution for automatically classifying and counting inorganic waste on mobile devices.

Keywords: SSD MobileNetV2, TensorFlow Lite, object detection, inorganic waste classification, mobile application, Android