ABSTRAK

Juliantara. KW, Pande Putu Ode (2026), *Komparasi Arsitektur Resnet50 Dan Mobilenetv2 Pada Klasifikasi Citra Rerajahan Ulap-Ulap Bali.* Tesis, Ilmu Komputer, Program Pascasarjana, Universitas Pendidikan Ganesha.

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Kata Kunci : Klasifikasi Citra, MobileNetV2, ResNet50, *Optimizer*, *Rerajahan Ulap-Ulap*

Penelitian ini bertujuan untuk membandingkan performa arsitektur ResNet50 dan MobileNetV2 dalam mengklasifikasikan sembilan kelas citra *rerajahan ulap-ulap* Bali, serta menguji pengaruh tiga optimizer, yaitu AdamW, Nadam, dan Adagrad, terhadap performa kedua arsitektur tersebut melalui skema *transfer learning* berbasis bobot *ImageNet*. Penelitian ini menggunakan desain eksperimental kuantitatif dengan dataset primer yang dikumpulkan langsung dari lima data pokok tiap kelas menggunakan kamera DSLR, kemudian diperkaya melalui augmentasi citra (*brightness*, *contrast*, *noise*, *shear*, dan blur) menjadi 3.888 data latih. Kedua arsitektur dimodifikasi dengan menambahkan lapisan klasifikasi kustom (*global average pooling*, *dense*, dan *softmax* sembilan kelas) serta *dropout* sebesar 0,6, dan dilatih melalui enam skenario hasil kombinasi dua arsitektur dan tiga *optimizer*. Validasi model dilakukan menggunakan metode 5 *fold cross validation*, dengan teknik analisis data berupa perhitungan *accuracy*, *precision*, *recall*, *f1-score*, dan *confusion matrix* pada setiap skenario, dilengkapi pengujian generalisasi menggunakan citra baru di luar dataset. Hasil penelitian menunjukkan bahwa Skenario 1 dan Skenario 2 sama-sama mencapai performa klasifikasi tertinggi dengan akurasi rata-rata yang identik sebesar 98,40%. Namun, berdasarkan analisis *cost and benefit* yang mempertimbangkan keseimbangan antara akurasi, *precision*, dan efisiensi biaya komputasi, kombinasi MobileNetV2 dengan optimizer Nadam (Skenario 2) ditetapkan sebagai model paling optimal dengan nilai *precision* 98,48%, *recall* 98,40%, *f1-score* 98,39%, waktu pelatihan rata-rata tersingkat sebesar 1,96 detik per *epoch*, dan skor *cost benefit* (Vi) tertinggi sebesar 0,9998, mengungguli Skenario 1 yang memperoleh skor Vi sebesar 0,9959 akibat kebutuhan waktu pelatihan yang sedikit lebih lama. Sementara itu, kombinasi ResNet50 dengan Adagrad mencatatkan performa terendah sebesar 24,81% akibat penyusutan *learning rate* yang ekstrem. Analisis kesalahan menunjukkan ambiguitas tertinggi pada pasangan kelas *bale dangin* dengan *bale delod* dan *padmasana* dengan *angkul-angkul* akibat kemiripan struktural. Disimpulkan bahwa MobileNetV2 lebih unggul dan efisien dibandingkan ResNet50 untuk klasifikasi citra budaya dengan data primer terbatas, meskipun performa model menurun saat diuji pada citra lapangan baru akibat *domain shift*. Penelitian lanjutan disarankan menjajaki arsitektur *vision transformer* dan memperluas variasi dataset primer.

ABSTRACT

Juliantara. KW, Pande Putu Ode (2026), *Comparison of ResNet50 and MobileNetV2 Architectures for Classifying Balinese Ulap-Ulap Rerajahan Images. Thesis, Computer Science, Postgraduate Program*, Universitas Pendidikan Ganesha.

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Keyword : *Image Classification*, MobileNetV2, ResNet50, *Optimizer*, *Rerajahan Ulap-Ulap*

This study aims to compare the performance of the ResNet50 and MobileNetV2 architectures in classifying nine classes of Balinese ulap-ulap rerajahan images, while also examining the influence of three optimizers, namely AdamW, Nadam, and Adagrad, on the performance of both architectures through an ImageNet-based transfer learning scheme. This study employed a quantitative experimental design using a primary dataset collected directly from five original images per class using a DSLR camera, which was subsequently enriched through image augmentation (brightness, contrast, noise, shear, and blur) into 3,888 training images. Both architectures were modified by adding a custom classification head (global average pooling, dense, and nine class softmax layers) with a dropout rate of 0.6, and were trained through six scenarios resulting from the combination of two architectures and three optimizers. Model validation was performed using 5-fold cross validation, with data analysis techniques comprising accuracy, precision, recall, f1-score, and confusion matrix calculations for each scenario, complemented by a generalization test using new images outside the dataset. The results show that Scenario 1 and Scenario 2 both achieved the highest classification performance, with an identical average accuracy of 98.40%. However, based on a cost and benefit analysis that weighs the balance between accuracy, precision, and computational cost efficiency, the combination of MobileNetV2 with the Nadam optimizer (Scenario 2) was determined to be the most optimal model, with a precision of 98.48%, recall of 98.40%, f1-score of 98.39%, the shortest average training time of 1.96 seconds per epoch, and the highest cost-benefit score (Vi) of 0.9998, outperforming Scenario 1, which obtained a Vi score of 0.9959 due to its slightly longer training time. Meanwhile, the combination of ResNet50 with Adagrad recorded the lowest performance at 24.81% due to extreme learning rate decay. Error analysis revealed the highest ambiguity between the Bale dangin with bale delod and padmasana with angkul-angkul class pairs due to their structural similarity. It is concluded that MobileNetV2 is superior and more efficient than ResNet50 for cultural image classification under limited primary data conditions, although model performance declined when tested on new field images due to domain shift. Further research is recommended to explore vision transformer architectures and expand the variation of primary datasets.