ABSTRAK

IMPLEMENTASI DEEP LEARNING MENGGUNAKAN MODEL DENSENET121 DAN YOLOV9 UNTUK KLASIFIKASI SPESIES LEBAH TANPA SENGAT DI LEMBAH SUHITA BANDAR LAMPUNG

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Identifikasi spesies lebah tanpa sengat secara manual masih bergantung pada keahlian khusus dan berpotensi menimbulkan kesalahan. Penelitian ini merancang sistem klasifikasi spesies lebah tanpa sengat di kawasan Lembah Suhita, Bandar Lampung. Sistem yang dirancang menggunakan arsitektur DenseNet121 dan YOLOv9 pada 1.470 citra yang terbagi ke dalam 7 kelas. Pengujian dilakukan pada ukuran input 224×224 dan 640×640 dengan teknik augmentasi yang sama, yaitu *flipping*, perubahan kecerahan, dan *random cropping*. Pada penelitian ini, DenseNet121 diterapkan menggunakan pendekatan *hybrid prediction* berbasis *embedding* dan indeks DLS, sedangkan YOLOv9 menggunakan data beranotasi *bounding box*. Pengembangan model dimulai dari melakukan pengumpulan data citra di Lembah Suhita, dilanjutkan dengan pra pemrosesan citra, pelatihan model, dan evaluasi model. Hasil menunjukkan bahwa model DenseNet121 dengan input 224×224 memberikan performa terbaik dengan akurasi (94,29%), DenseNet121 dengan input 640×640 menghasilkan akurasi (92,14%), YOLOv9 dengan input 640x640 menghasilkan akurasi (89%) dan YOLOv9 dengan input 224×224 menghasilkan akurasi (93%).

Kata Kunci : *Computer vision*, Klasifikasi gambar, DenseNet121, YOLOv9.

ABSTRACT

IMPLEMENTATION OF DEEP LEARNING USING DENSENET121 AND YOLOV9 MODELS FOR CLASSIFICATION OF STINGLESS BEE SPECIES AT LEMBAH SUHITA, BANDAR LAMPUNG

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Manual species identification still relies heavily on specialized expertise and is prone to errors. This study design a classification system for stingless honey bee species in the Suhita Valley area, Bandar Lampung. This system uses the DenseNet121 and YOLOv9 architectures on 1,470 images which are divided into 7 classes. Experiments were conducted using input sizes of 224×224 and 640×640 with the same augmentation techniques, namely flipping, brightness adjustment, and random cropping. In this study, DenseNet121 was implemented using a hybrid prediction approach based on embeddings and a DLS index, while YOLOv9 utilized data annotated with bounding boxes. The model development process began with image data collection in Suhita Valley, followed by image preprocessing, model training, and model evaluation. The results show that DenseNet121 with a 224×224 input achieved an accuracy of 94.29%, DenseNet121 with a 640×640 input achieved an accuracy of 92.14%, YOLOv9 with a 640×640 input achieved an accuracy of 89%, and YOLOv9 with a 224×224 input achieved an accuracy of 93%. In this study, the test results on the data used showed that the DenseNet121 model with 224x224 input has higher accuracy compared to other models tested.

Key words: Computer vision, Image Classification, DenseNet121, YOLOv9.