

INTISARI

SISTEM PENDETEKSI PENYAKIT PADA DAUN TANAMAN KOPI BERBASIS WEB MENGGUNAKAN ALGORITMA RESNET50V2

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Kopi merupakan komoditas bernilai tinggi dan Indonesia menjadi produsen kopi terbesar ke-4 dunia. Sebagai produsen kopi terbesar ke-4 dunia, Indonesia memiliki tanggung jawab untuk menjaga kualitas dan kuantitas produksinya agar tetap memenuhi permintaan pasar global. Namun, serangan hama menjadi tantangan utama bagi produksi tanaman kopi. Teknologi *machine learning*, khususnya klasifikasi hama tanaman kopi, menawarkan solusi dengan automasi berbasis gambar daun kopi. Proyek Akhir ini melakukan klasifikasi hama tanaman kopi dengan menggunakan data gambar daun kopi yang terinfeksi hama *cercospora*, *miner*, *phoma* dan *leaf rust*. Implementasi *machine learning* dilakukan dengan membandingkan performa model CNN ResNet50V2 dan InceptionV3, yang dioptimalkan melalui *fine-tuning hyperparameter* yaitu *learning rate*, *dropout*, dan jumlah unit layer. Setiap *hyperparameter* memiliki dua variasi: *learning rate* (0.001 dan 0.0001), *dropout* (0 dan 0.25), serta jumlah unit layer (512 dan 1024). Berdasarkan 16 eksperimen, didapatkan model terbaik yaitu model ResNet50V2 dengan *learning rate* 0.0001, *dropout* 0, dan jumlah unit 1024. Analisis menunjukkan bahwa *learning rate* yang kecil, *dropout* yang kecil, dan jumlah unit yang besar pada layer memberikan performa terbaik. Model terbaik memiliki akurasi pelatihan 92,73%, validasi 84,72%, pengujian 86,96%, dengan *precision* 0.88, *recall* 0.87, dan *f1-score* 0.87. Sistem diuji menggunakan *black box testing*, *user acceptance test*, dan *load testing*, dan didapatkan hasil kinerja yang sangat baik. Sistem ini dapat membantu para petani dalam mengklasifikasikan hama tanaman kopi secara efektif.

Kata kunci : *Computer Vision, Image Classification, Deep Learning, Machine Learning, Web Application.*

ABSTRACT

WEB-BASED PEST DETECTION SYSTEM ON COFFEE PLANT LEAVES USING RESNET50V2 ALGORITHM

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Coffee is a high-value commodity, and Indonesia is the fourth-largest coffee producer in the world. As the world's fourth-largest coffee producer, Indonesia has a responsibility to maintain the quality and quantity of its production to continue to meet global market demand. However, pest attacks pose a major challenge to coffee production. Machine learning technology, particularly for classifying coffee plant pests, offers a solution through automation based on coffee leaf images. This final project classifies coffee plant pests using image data of coffee leaves infected by cercospora, miner, phoma, and leaf rust. Machine learning was implemented by comparing the performance of CNN models ResNet50V2 and InceptionV3, optimized through hyperparameter fine-tuning, including learning rate, dropout, and the number of units in each layer. Each hyperparameter had two variations: learning rate (0.001 and 0.0001), dropout (0 and 0.25), and the number of units (512 and 1024). Based on 16 experiments, the best model was ResNet50V2 with a learning rate of 0.0001, dropout of 0, and 1024 units. The analysis showed that a smaller learning rate, smaller dropout, and a larger number of units in the layers resulted in the best performance. The best model achieved a training accuracy of 92.73%, validation accuracy of 84.72%, testing accuracy of 86.96%, with a precision of 0.88, recall of 0.87, and an F1-score of 0.87. The system was tested using black box testing, user acceptance testing, and load testing, and demonstrated excellent performance. This system is to help farmers classify coffee plant pests effectively.

Keywords: Computer Vision, Image Classification, Deep Learning, Machine Learning, Web Application.