IMPLEMENTASI MODEL KLASIFIKASI PENYAKIT CABAI DENGAN DATA AUGMENTASI DAN TRANSFER LEARNING

SKRIPSI

diajukan untuk memenuhi sebagian syarat memperoleh gelar Sarjana Ilmu Komputer

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ABSTRAK

Cabai merah merupakan komoditas penting dalam sektor hortikultura di Indonesia, namun produksinya sering kali terganggu oleh penyakit yang disebabkan oleh patogen seperti jamur, bakteri, dan virus. Penelitian ini bertujuan untuk mengembangkan model klasifikasi penyakit tanaman cabai yang akurat dan efisien meskipun menggunakan dataset yang terbatas, dengan memanfaatkan pendekatan deep learning berbasis transfer learning. Dua model pre-trained, yaitu InceptionV3 dan ResNet50, dievaluasi dengan pendekatan pembekuan (freeze) dan pelatihan ulang seluruh lapisan (unfreeze). Teknik augmentasi data, seperti RandAugment dan metode sederhana (rotasi, flip, dan penyesuaian pencahayaan), digunakan untuk meningkatkan variasi dataset. Hasil penelitian menunjukkan bahwa model InceptionV3 dengan pengaturan unfreeze dan augmentasi sederhana mencapai akurasi pengujian tertinggi sebesar 91,2%. Selain itu, model ResNet50 dengan pengaturan unfreeze dan RandAugment menunjukkan peningkatan akurasi pengujian sebesar 14,6% dibandingkan akurasi validasi, yang menyoroti keunggulan RandAugment dalam membantu generalisasi model pada data baru. Di sisi lain, pengaturan freeze pada ResNet50 memberikan stabilitas yang lebih baik pada dataset kecil dengan variabilitas tinggi. Penelitian ini menunjukkan bahwa pemilihan strategi tuning dan teknik augmentasi harus disesuaikan dengan karakteristik model dan dataset untuk mencapai performa optimal. Temuan ini memberikan kontribusi signifikan bagi pengembangan sistem deteksi penyakit cabai berbasis deep learning yang dapat meningkatkan efisiensi produksi, mengurangi kerugian akibat penyakit, dan mendukung keberlanjutan sektor pertanian di Indonesia.

Kata Kunci: Penyakit Tanaman Cabai, Convolutional Neural Network, Transfer Learning, Augmentasi Data, RandAugment

IMPLEMENTATION OF CHILI DISEASE CLASSIFICATION MODEL WITH DATA AUGMENTATION AND TRANSFER LEARNING

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ABSTRACT

Red chili is an essential commodity in Indonesia's horticultural sector, but its production is often disrupted by diseases caused by pathogens such as fungi, bacteria, and viruses. This study aims to develop an accurate and efficient model for classifying chili plant diseases despite using a limited dataset, leveraging a deep learning approach based on transfer learning. Two pre-trained models, InceptionV3 and ResNet50, were evaluated using freezing (freeze) and fine-tuning all layers (unfreeze). Data augmentation techniques, such as RandAugment and simple methods (rotation, flipping, and lighting adjustments), were applied to enhance dataset variation. The results showed that the InceptionV3 model with unfreeze configuration and simple augmentation achieved the highest testing accuracy of 91.2%. Additionally, the ResNet50 model with unfreeze configuration and RandAugment demonstrated a 14.6% improvement in testing accuracy compared to validation accuracy, highlighting RandAugment's superiority in improving model generalization on new data. On the other hand, the freeze configuration on ResNet50 provided better stability on small datasets with high variability. This study emphasizes that the choice of tuning strategies and augmentation techniques should be tailored to the model and dataset characteristics to achieve optimal performance. These findings contribute significantly to the development of deep learning-based chili disease detection systems, which can improve production efficiency, reduce losses caused by diseases, and support the sustainability of Indonesia's agricultural sector.

Keywords: *Chili Plant Disease, Convolutional Neural Network, Transfer Learning, Data Augmentation, RandAugment*

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