

PERBANDINGAN MODEL CNN DAN SVM PADA KLASIFIKASI PENYAKIT DAUN TANAMAN PAPRIKA DI DESA PANCASARI

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ABSTRAK

Penelitian ini membandingkan kinerja model *Convolutional Neural Network* (CNN) dan *Support Vector Machine* (SVM) untuk mengklasifikasikan penyakit pada daun tanaman paprika di Desa Pancasari, Kabupaten Buleleng, Bali. Masalah utama yang dihadapi petani adalah penurunan hasil panen hingga 66% (dari 300 kg/minggu menjadi 100 kg/minggu) akibat serangan hama *thrips*, jamur *Cercospora capsici*, dan virus *Xanthomonas campestris*. Dataset terdiri dari 173 gambar asli daun paprika yang dikelompokkan menjadi empat kelas: sehat (42 gambar), hama (38 gambar), jamur (44 gambar), dan virus (49 gambar). Teknik augmentasi diterapkan dengan rotasi (15° – 270°) dan *flip* horizontal/vertikal, menghasilkan 1.390 gambar untuk *data train*. Model CNN diuji dengan tiga skenario: *early stopping* (patience=5), pelatihan 50 epoch, dan 100 epoch, menggunakan arsitektur dua lapisan konvolusi (32 dan 64 filter) dan *dropout* 0.5. SVM dievaluasi dengan tiga kernel (linear, polinomial, RBF) berdasarkan fitur warna (RGB, HSL) dan tekstur (Sobel). Hasil menunjukkan CNN dengan *early stopping* mencapai akurasi tertinggi (97%), diikuti SVM kernel polinomial (akurasi 94%). Analisis *confusion matrix* menunjukkan CNN lebih konsisten dalam mengidentifikasi semua kelas, khususnya kelas virus (presisi dan recall 1.00). Keunggulan CNN terletak pada ekstraksi fitur secara otomatis, sementara SVM mengandalkan ekstraksi fitur manual yang ditentukan sebelumnya. Temuan ini mendukung pengembangan sistem deteksi penyakit dalam *Smart Green House* (SGH) tanaman paprika di Desa Pancasari.

Kata kunci: CNN, Daun Paprika, Klasifikasi, Smart Green House, SVM

COMPARISON OF CNN AND SVM MODELS ON CLASSIFICATION OF LEAF DISEASES OF BELL PEPPER PLANTS IN PANCASARI VILLAGE

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ABSTRACT

This study compares the performance of Convolutional Neural Network (CNN) and Support Vector Machine (SVM) models to classify diseases on the leaves of bell pepper plants in Pancasari Village, Buleleng Regency, Bali. The main problem faced by farmers is a 66% (from 300 kg/week to 100 kg/week) reduction in yield due to thrips, *Cercospora capsici* fungus, and *Xanthomonas campestris* virus. The dataset consists of 173 original images of bell pepper leaves grouped into four classes: healthy (42 images), pest (38 images), fungus (44 images), and virus (49 images). Augmentation techniques were applied with rotation (15°-270°) and horizontal/vertical flip, resulting in 1,390 images for the train data. CNN models were tested with three scenarios: early stopping (patience=5), 50 epochs pelatihan, and 100 epochs, using a two-layer convolution architecture (32 and 64 filters) and 0.5 dropout. SVMs were evaluated with three kernels (linear, polinomial, RBF) based on color (RGB, HSL) and texture (Sobel) features. Results showed CNN with early stopping achieved the highest accuracy (97%), followed by polinomial kernel SVM (94% accuracy). Confusion matrix analysis shows CNN is more consistent in identifying all classes, especially the virus class (precision and recall 1.00). The advantage of CNN lies in automatic feature extraction, while SVM relies on pre-defined manual feature extraction. These findings support the development of a disease detection system in the Smart Green House (SGH) of paprika plants in Pancasari Village.

Keywords: CNN, Classification, Paprika Leaf, Smart Green House, SVM