

ABSTRAK

Hipertensi, atau dikenal sebagai "pembunuh senyap", merupakan masalah kesehatan global yang serius karena perkembangannya sering tanpa gejala signifikan hingga menyebabkan kerusakan organ vital. Menurut World Health Organization (WHO), sekitar 1,28 miliar orang dewasa di dunia menderita hipertensi, dengan prevalensi di Indonesia mencapai 34,1% pada individu berusia ≥ 18 tahun. Kurangnya deteksi dini dan kesadaran masyarakat memperburuk kondisi ini, sehingga meningkatkan risiko komplikasi seperti penyakit jantung, stroke, dan gagal ginjal. Penelitian ini bertujuan mengembangkan sistem klasifikasi hipertensi menggunakan metode Support Vector Machine (SVM) dengan Kernel Polynomial untuk meningkatkan akurasi deteksi dini. SVM dipilih karena kemampuannya menangani data berdimensi tinggi dan kompleks, serta ketahanannya terhadap overfitting. Penelitian ini menggunakan dataset dari Behavioral Risk Factor Surveillance System (BRFSS) yang terdiri dari 26.083 sampel dengan 13 fitur klinis seperti usia, tekanan darah, kolesterol, dan hasil EKG. Pada tahap pra-pemrosesan dilakukan penanganan missing value, label encoding, dan normalisasi menggunakan Min-Max Scaler. Model SVM dioptimalkan dengan parameter $C = 10$, $\gamma = 0.7$, dan degree = 3, yang dipilih berdasarkan studi literatur dan karakteristik data. Hasil evaluasi menunjukkan bahwa model mencapai akurasi 99% pada rasio pembagian data 80:20 (training:testing), dengan presisi 98,34%, recall 99,4%, dan F1-score 98,87%. Tingginya nilai recall mengindikasikan kemampuan model dalam mendeteksi kasus hipertensi secara komprehensif. Implementasi model ke dalam aplikasi berbasis Streamlit memungkinkan prediksi risiko hipertensi secara real-time berdasarkan input parameter klinis.

Kata kunci: SVM, Klasifikasi, Hipertensi, *Kernel Polynomial*, Deteksi Dini.

ABSTRACT

Hypertension, also known as the "silent killer," is a serious global health issue due to its tendency to develop without significant symptoms until it causes damage to vital organs. According to the World Health Organization (WHO), approximately 1.28 billion adults worldwide suffer from hypertension, with a prevalence rate in Indonesia reaching 34.1% among individuals aged 18 and above. The lack of early detection and public awareness exacerbates this condition, increasing the risk of complications such as heart disease, stroke, and kidney failure. This study aims to develop a hypertension classification system using the Support Vector Machine (SVM) method with a Polynomial Kernel to enhance the accuracy of early detection. SVM was chosen for its ability to handle high-dimensional and complex data, as well as its robustness against overfitting. The study uses a dataset from the Behavioral Risk Factor Surveillance System (BRFSS), consisting of 26,083 samples with 13 clinical features such as age, blood pressure, cholesterol, and ECG results. In the preprocessing stage, missing values were handled, label encoding was applied, and normalization was performed using the Min-Max Scaler. The SVM model was optimized with parameters $C = 10$, $\gamma = 0.7$, and $\text{degree} = 3$, selected based on literature review and data characteristics. Evaluation results show that the model achieved 99% accuracy with an 80:20 train-test split, along with 98.34% precision, 99.4% recall, and a 98.87% F1-score. The high recall value indicates the model's strong capability in comprehensively detecting hypertension cases. The implementation of this model into a Streamlit-based application enables real-time prediction of hypertension risk based on clinical parameter inputs.

Keywords: SVM, Classification, Hypertension, Polynomial Kernel, Early Detection.