SISTEM PENDETEKSI PENYAKIT JANTUNG BERBASIS *MACHINE LEARNING* DENGAN METODE *SUPPORT VECTOR MACHINE* (SVM)

ABSTRAK

Penelitian ini bertujuan untuk membangun sistem pendeteksi penyakit jantung berbasis web menggunakan metode *Support Vector Machine* (SVM) dengan *optimasi Particle Swarm Optimization* (PSO). Dataset yang digunakan terdiri atas 507 data dengan enam kelas diagnosis, yaitu Aritmia, Endokarditis, Gagal Jantung, Normal, Penyakit Jantung Bawaan (PJB), dan Penyakit Jantung Koroner (PJK). Tahapan penelitian meliputi preprocessing data, pembagian data menjadi 80% data latih dan 20% data uji, penerapan SVM dengan kernel Radial Basis Function (RBF), serta optimasi parameter C dan Gamma menggunakan PSO. Evaluasi model dilakukan menggunakan Accuracy, Precision Macro, Recall Macro, dan F1-Score Macro. Hasil pengujian terhadap 102 data uji menunjukkan bahwa model SVM tanpa optimasi PSO memperoleh Accuracy sebesar 86,27%, Precision Macro sebesar 85,98%, Recall Macro sebesar 85,98%, dan F1-Score Macro sebesar 85,69%. Sementara itu, model SVM dengan optimasi PSO memperoleh Accuracy sebesar 87,25%, Precision Macro sebesar 87,09%, Recall Macro sebesar 87,02%, dan F1-Score Macro sebesar 86,80%. Hasil tersebut menunjukkan bahwa model SVM dengan optimasi PSO memberikan peningkatan pada seluruh metrik evaluasi data uji, dengan peningkatan akurasi sebesar 0,98 poin persentase. Hasil evaluasi menunjukkan bahwa model SVM dengan optimasi PSO memperoleh kinerja yang lebih baik pada data uji dibandingkan model SVM tanpa optimasi, dengan nilai akurasi sebesar 87,25%. Sistem yang dibangun diharapkan dapat membantu proses klasifikasi awal penyakit jantung berdasarkan data kesehatan pasien serta menyajikan informasi hasil klasifikasi secara lebih cepat dan terstruktur.

Kata kunci**:** Penyakit Jantung, Support Vector Machine, Particle Swarm Optimization, Klasifikasi.

HEART DISEASE DETECTION SYSTEM BASED ON MACHINE LEARNING USING SUPPORT VECTOR MACHINE (SVM)

ABSTRACT

The objective of this investigation is to establish a web-based system for detecting heart illness utilizing the Support Vector Machine (SVM) approach refined through Particle Swarm Optimization (PSO). The data compilation includes 507 records with six diagnostic classes: Arrhythmia, Endocarditis, Heart Failure, Normal, Congenital Heart Disease (CHD), and Coronary Heart Disease (CHD). The research stages include data preprocessing, splitting the dataset into 80% training data and 20% testing data, implementing Support Vector Machine utilizing the Radial Basis Function kernel, with the C and gamma parameters being optimized through Particle Swarm Optimization. The assessment of model performance was conducted utilizing Accuracy, Macro Precision, Macro Recall, and Macro F1-Score. The assessment of 102 test records showed that the SVM model without PSO optimization achieved an Accuracy of 86.27%, Macro Precision of 85.98%, Macro Recall of 85.98%, and Macro F1-Score of 85.69%. Meanwhile, the SVM model optimized with PSO achieved an Accuracy of 87.25%, Macro Precision of 87.09%, Macro Recall of 87.02%, and Macro F1-Score of 86.80%. These results indicate that the SVM model optimized with PSO improved all evaluation metrics on the test data, with an accuracy increase of 0.98 percentage points. Overall, the SVM model optimized with PSO achieved better performance on the test data than the SVM model without optimization, with an accuracy of 87.25%. The developed system is expected to assist in the initial classification of heart disease based on patients' health data and provide classification results more quickly and systematically.

Keywords: Heart Disease, Support Vector Machine, Particle Swarm Optimization, Classification.