

ABSTRAK

Penelitian ini bertujuan mengklasifikasikan aritmia jantung menggunakan kombinasi fitur sinyal Elektrokardiogram (EKG) berbasis denyut dan fitur Heart Rate Variability (HRV) domain waktu dengan algoritma Extreme Gradient Boosting (XGBoost). Data berasal dari MIT-BIH Arrhythmia Database yang berisi sinyal EKG satu kanal beserta anotasi denyut jantung. Tahap pra-pemrosesan meliputi exploratory data analysis (EDA), penanganan nilai kosong, zero padding untuk menyeragamkan panjang sinyal, interpolasi linear untuk menjaga kontinuitas sinyal, serta normalisasi menggunakan StandardScaler. Fitur HRV domain waktu yang digunakan meliputi MeanRR, SDNN, RMSSD, dan pNN50 yang dihitung dari interval R-R. Model dilatih menggunakan data latih dan dievaluasi menggunakan accuracy, precision, recall, F1-score, serta confusion matrix. Hasil penelitian menunjukkan bahwa kombinasi fitur EKG dan HRV domain waktu mampu memberikan performa klasifikasi yang stabil dalam membedakan denyut jantung normal dan aritmia. Pendekatan ini berpotensi dikembangkan sebagai sistem pendukung deteksi dini aritmia berbasis machine learning.

Kata kunci: Elektrokardiogram, HRV Domain Waktu, XGBoost, Klasifikasi Aritmia.

“This study aims to classify cardiac arrhythmia using a combination of beat-based Electrocardiogram (ECG) signal features and time-domain Heart Rate Variability (HRV) features with the Extreme Gradient Boosting (XGBoost) algorithm. The dataset was obtained from the MIT-BIH Arrhythmia Database containing single-lead ECG signals with annotated heartbeats. Preprocessing steps included exploratory data analysis (EDA), handling missing values, zero padding to standardize signal length, linear interpolation to maintain signal continuity, and feature normalization using StandardScaler. Time-domain HRV features used in this study were MeanRR, SDNN, RMSSD, and pNN50 derived from R-R intervals. The model was evaluated using accuracy, precision, recall, F1-score, and confusion matrix. Results indicate that combining ECG signal features with time-domain HRV features provides stable performance in classifying normal and arrhythmic heartbeats. The proposed approach shows potential for further development as a machine learning-based arrhythmia detection support system.”

Keywords: Electrocardiogram, Time-Domain HRV, XGBoost, Arrhythmia Classification.