

ABSTRACT

Coronary heart disease is one of the leading causes of death globally. This study aims to gain a more comprehensive understanding of heart conditions through analysis of electrocardiogram (ECG) signals, particularly heart rate variability (HRV), using a fractal analysis approach. HRV data was obtained from R-peak detection and processed to derive time-domain features, namely Standard Deviation of RR intervals (SDRR) and Root Mean Square of Successive Differences (RMSSD). Fractal analysis was performed using the Detrended Fluctuation Analysis (DFA) method, Hurst Exponent, Higuchi Fractal Dimension (HFD), Maximum Fractal Length (MFL), and Poincaré. The obtained features were then selected using the Minimum Redundancy Maximum Relevance (mRMR) method, while classification of normal heart conditions and coronary artery disease was performed using Support Vector Machine (SVM). The results of the study indicate that fractal features are capable of representing the complexity of HRV signals, with several parameters showing significant differences between the normal and CAD groups. The SVM model with a specific kernel configuration achieved high accuracy in testing and consistent cross-validation values. These findings confirm that the combination of fractal analysis and SVM has the potential to be utilized for early detection of coronary heart disease and supports the development of accurate and informative health monitoring systems based on EKG.

Keywords: *Coronary Heart Disease, Heart Rate Variability, Fractal Analysis, Detrended Fluctuation Analysis (DFA), Higuchi Fractal Dimension (HFD), Maximum Fractal Length (MFL), Poincaré, and Support Vector Machine (SVM).*