Diagnosis of Acute Coronary Syndrome with CNN and LSTM Based Deep Learning Model

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Abstract:

Early and accurate diagnosis of acute coronary syndrome (ACS) and its subtypes is essential for patient health. The aim of this study is to develop a deep learning approach utilizing electrocardiography (ECG) signals to classify ACS and its different types. The model was constructed using a combination of convolutional neural network and long short-term memory structures to categorize ECG signals representing acute myocardial infarction with ST-elevation (STEMI), myocardial infarction without ST-elevation (NSTEMI), and healthy individuals. The dataset comprises 12-lead ECG signals collected from patients who presented with chest pain at the Erciyes University Hospital Emergency Department. ECG data were processed to remove noise using notch, low-pass, and high-pass filters, and then standardized using z-score normalization. Model performance was assessed through k-fold cross-validation, calculating metrics such as accuracy, sensitivity, specificity, precision, F1 score, and classification rate. With 5-fold cross-validation, classification accuracy was observed to be 0.928 ± 0.0172 for the ACS-Normal group, 0.891 ± 0.0083 for the NSTEMI-Normal group, and 0.886 ± 0.02275 for the STEMI-Normal group. These findings suggest that the proposed deep learning model is effective in distinguishing ACS and its subtypes, showing promise for future integration into clinical applications.

Keywords:

Acute Coronary Syndrome, Deep Learning, ECG, Classification.