ABSTRACT

Myocardial infarction (MI) is a leading cause of death due to cardiovascular diseases in Indonesia. The electrocardiogram (ECG) is the most commonly used method to detect changes in the heart's electrical activity related to this condition. This study aims to develop an ECG signal classification system for myocardial infarction detection using a hybrid approach that combines Convolutional Neural Network (CNN) and Long Short-Term Memory (LSTM), and to compare its performance with the Bidirectional LSTM (BiLSTM) architecture.

The method involves two hybrid models, CNN-LSTM and CNN-BiLSTM, where CNN and LSTM are used to capture temporal patterns from ECG signals. Hyperparameter optimization was conducted using grid search with 5-fold cross-validation, and model performance was evaluated based on accuracy, precision, recall, F1-score, and ROC-AUC.

The results show that both models achieved good classification performance. The CNN-LSTM model achieved an accuracy of 0.922, precision of 0.921, recall of 0.922, F1-score of 0.922, and a ROC-AUC of 0.974. Meanwhile, the CNN-BiLSTM model showed a slight performance improvement with an accuracy of 0.923, precision of 0.924, recall of 0.923, and F1-score of 0.924, although the ROC-AUC was slightly lower at 0.973. Although BiLSTM enables bidirectional temporal processing, the performance gain was relatively minor and not significant compared to the increased architectural complexity. Therefore, CNN-LSTM is considered a more efficient yet still effective approach for classifying ECG signals in myocardial infarction detection.

Keywords: *myocardial infarction, ECG, CNN-LSTM, BiLSTM, signal classification, deep learning.*