Abstract

This study focuses on detecting myocardial infarction using hybrid deep learning methods on Phonocardiogram (PCG) signals. We propose a hybrid model combining Convolutional Neural Network (CNN) with Long Short-Term Memory (LSTM), Bidirectional LSTM (BiLSTM), and Gated Recurrent Unit (GRU). The performance of these algorithms is compared to determine the most effective for myocardial infarction detection. Feature extraction involved six methods, producing 46 features for analysis.

The analysis revealed that the non-tuned CNN-LSTM, CNN-BiLSTM, and CNN-GRU models showed less robustness due to inconsistencies in training and validation datasets. However, their tuned counterparts demonstrated significant improvements. The tuned CNN-LSTM achieved 92.86% accuracy, 94.38% precision, and 93.33% F1-Score. The CNN-BiLSTM tuning resulted in similar accuracy but slightly lower precision and F1-Score. Remarkably, the tuned CNN-GRU model outperformed others, reaching the highest accuracy of 94.05%, precision of 92.47%, and F1-Score of 94.51%, showing strong consistency between training and validation datasets. This study highlights the importance of tuning in enhancing the performance and reliability of hybrid deep learning models in cardiovascular disease detection.

Keywords: Myocardial infarction, Deep Learning, Hybrid Deep Learning, PCG signal.