ABSTRACT

Deep learning (DL) models demonstrate superior accuracy in analyzing ECG signals for myocardial infarction detection. However, this approach is often considered a "black box," making it difficult for medical professionals to interpret. This study evaluates the application of explainable AI (XAI), namely Grad-CAM and LRP, to improve the interpretability of different DL models for myocardial infarction detection using ECG signals. The results show that Grad-CAM provides spatial explanations with consistent positive attributions and simpler outputs, while LRP can provide both positive and negative attributions, distinguish relevance across leads, and is not dependent on the spatial resolution of the model's internal layers. Furthermore, combining Grad-CAM for temporal analysis and LRP for lead relevance analysis offers the most comprehensive model interpretation and is recommended for evaluating the clinical relevance of DL models. Finally, among the three convolutional architectures tested, the InceptionTime model was found to be the best, achieving the highest accuracy and the greatest utilization of ECG leads.

Keywords: *deep learning, electrocardiogram, myocardial infarction, XAI*