

ABSTRACT

The diagnosis of heart disease from Electrocardiogram (ECG) images presents a clinical challenge due to the subjective and time-consuming nature of manual interpretation. This research develops an automated classification system with a 12-lead ECG image as its input and one of four diagnostic classes as its output.

Automating ECG interpretation is crucial for improving diagnostic efficiency and standardization. However, existing research often focuses on a single deep learning architecture with a single data preparation method. Consequently, there is a lack of systematic studies that fairly compare the impact of various data representation strategies and architectures.

This study employed a two-stage approach. First, an exploration of three data representation strategies was conducted to determine the most effective preprocessing pipeline. Second, the best-performing pipeline was used to train and compare the performance of three different multi-input transfer learning architectures—namely MobileNetV2, ResNet50, and InceptionV3—to identify the model with the most superior performance.

Experimental results indicated that the preprocessing strategy separating the 12-lead and long-lead signals yielded the best performance. In the model comparison stage, the ResNet50 architecture demonstrated superior performance, achieving a final test accuracy of 94,09% and a macro F1-Score of 93,89%. This research proves that a multi-input architecture based on ResNet50, powered by an optimized data pipeline, is an effective and reliable solution for heart disease classification from ECG images.

Keywords: *ecg classification, deep learning, transfer learning, convolutional neural network, image processing, multi-input model*