ABSTRACT

Premature Ventricular Contraction (PVC) is a type of arrhythmia characterized by a widened QRS complex exceeding 120 ms and the absence of a P wave. The objective of this research is to develop a system capable of measuring electrocardiogram (ECG) signals using a portable device and applying the K-Nearest Neighbors (KNN) algorithm to detect PVC arrhythmias based on ECG data.

In this study, the system was designed using the ADS1293 ECG sensor module and an ESP32 microcontroller. The ADS1293 module reads cardiac electrical signals and performs signal conditioning, while the ESP32 transmits ECG data wirelessly to a mobile application. The application processes the data and performs classification using the KNN algorithm, which outputs beat labels as either normal or PVC and displays the results visually.

The testing results show that the portable ECG device can produce valid ECG signals with a stable sampling rate of 267 Hz, amplitude within physiological range, and clearly visible PQRST wave morphology. Heart rate measurements were also consistent with those from a reference pulse oximeter. The KNN model, trained using data from the MIT-BIH Arrhythmia Database, achieved an accuracy of 92,85% and an F1-score of 0.93 on the test data. The model was successfully integrated into a mobile application and tested on ECG signals recorded from real subjects.

Keywords: *Electrocardiogram (ECG), Arrhythmia, Premature Ventricular Contraction (PVC), K-Nearest Neigbors (KNN)*