ABSTRACT

An ECG signal or Electrocardiogram signal is a basic raw signal to identify and Classify heart function based on heart rate. The electrocardiogram main task is to analyze the signal on the heart is normal or abnormal, on each recorded ECG signal. An abnormal shape of a regular signal, irregular amplitude or time interval will produce an Arrhythmia . Neural network methods such as CNN have better performance to clasify the ECG signal than conventional Classification methods. Combining the CNN method with other neural network methods such as LSTM, apart from having good Classification performance, is also considered to reduce errors in prediction. Even so, the performance of the Classification depends on the optimizer and layer used, so it is necessary to use the right optimizer and layers for optimal Classification performance.

In this study we will try to improve the Classification performance of the ECG signal using the CNN and LSTM ensemble method using the ADAM optimizer as the optimization algorithm and the Global Average Pooling layer as a substitute for the Fully Connected Layer. To evaluate the proposed method, a public *dataset* is the MIT-BIH Arrhythmia which consists of 48 ECG signal recordings for 30 minutes. The *dataset* first goes through the pre-processing stage in order to facilitate further processing. The *dataset* that has passed the pre-processing stage is divided into 2 data, namely training data and test data with a ratio of 80:20. The training data is then divided again into training data and validation data with a ratio of 80:20.

The experimental results show that the proposed CNN model is able to get an Accuracy of 99.7% during training and a validation Accuracy of 98.9%. The proposed LSTM model is able to get an Accuracy of 99.8% when training and a validation Accuracy of 98.9%. At the time of testing the two models were combined and succeeded in obtaining an Accuracy of 98.86%. This shows that the proposed method can improve the performance of the ECG signal Classification

Keywords: *Electrocardiography, Convolutional Neural Network, Long Short-term Memory, Signal Processing, Ensemble.*