GA-NN APPROACH FOR ECG FEATURE SELECTION IN RULE BASED ARRHYTHMIA CLASSIFICATION

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Abstract: Computer-aided ECG analysis is very important for early diagnosis of heart diseases. Automated ECG analysis integrated with experts' opinions may provide more accurate and reliable results for detection of arrhythmia. In this study, a novel genetic algorithm-neural network (GA-NN) approach is proposed as a classifier, and compared with other classification methods. The GA-NN approach was shown to perform better than alternative approaches (e.g. k-nn, SVM, naïve Bayes, Bayesian networks) on the UCI Arrythmia and the novel TEPAS ECG datasets, where the GA resulted in a feature reduction of 95%. Based on the selected features, several rule extraction algorithms are applied to allow the interpretation of the classification results by the experts. In this application, the accuracy and interpretability of results are more important than processing speed. The results show that neural network based approaches benefit greatly from dimensionality reduction, and by employing GA, we can train the NN reliably.

1. Introduction

Alterations that disrupt the regular functioning of the heart cycle may cause cardiac arrhythmia, which might be a potential reason for a heart disease. Thus, early detection of arrhythmia can save lives. Electrocardiogram (ECG) is widely used for the diagnosis of such abnormalities. ECG output must be integrated with medical assessment to provide more meaningful results, however, ECG analysis as a part of clinical assessment requires expert knowledge. Automated ECG analysis integrated with experts' opinions provides more robust and reliable results to detect abnormal patterns.

In this paper, we aim to detect arrhythmic patterns in a rule-based manner in order to aid the cardiologists. We propose a genetic algorithm-neural network

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