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# A Novel Adaptive feature extraction for detection of cardiac Arrhythmias using Hybrid technique MRDWT & MPNN Classifier from ECG Big Data

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**Abstract**— The efficient automatic detection of cardiac arrhythmia using a hybrid technique from ECG big data has been proposed with novel feature extraction technique using Multiresolution Discrete Wavelet Transform (MRDWT) and Multilayer Probabilistic Neural Network (MPNN) classifier. Big Data of ECG signals have been selected from MIT-BIH arrhythmia database for detection of two types of arrhythmias LBBB (Left Bundle Branch Block) and RBBB (Right Bundle Branch Block). The proposed technique can accurately detect and classify LBBB and RBBB along with normal heartbeat. A novel and hybrid method of detection of cardiac arrhythmia have four main stages: denoising of raw ECG, baseline wander removal, proposed feature extraction, and detection of abnormal heartbeats using MPNN neural classifier. 8600 ECG beats were selected, including 4200 normal and 4400 abnormal beats (2200 LBBB and 2200 RBBB) were utilized for testing the proposed technique. The detection outcome using MPNN was compared with other two neural classifiers: Feed Forward neural network (FFNN) and Back Propagation Neural Network (BPNN) classifiers. The accuracy and efficiency of classifiers performance were attained in terms of CER (Classification Error Rate), SP (Specificity), Se (Sensitivity), Pr (Precision), PPr (Positive Predictivity) and F-Score. The system performance is achieved with 96.22%, 97.15 % and 99.07% overall accuracy using FFNN, BPNN and MPNN. The average percentage of classification error rate (CER) using MPNN classifier is lowest 0.62% whereas FFNN and BPNN show 2.2% and 1.90% average CER.

**Keywords**- Big Data; Cardiac Arrhythmias; Biomedical Signal Processing; Artificial Intelligence, Machine Learning.

## I. INTRODUCTION

The manual process of clinical observation of abnormal heartbeat detection may take a long time and can be a very tough task. We know that ECG (Electrocardiogram) recording available for the experts to diagnosis are in the pictorial format on a graph paper, hence in case of pictorial have more possibilities of missing the vital information and we cannot completely rely upon it. Hence, automatic analysis based on the computer for the classification and detection of diseases can be very cooperative and helpful in diagnosis. In the recent era, the classification and detection of heart diseases have shaped a center of consideration for scientists, doctors and researchers

since it can benefit cardiologists to detect cardiac arrhythmias from ECG heartbeats data.

According to the recent report of world health organization (WHO), the current scenario of India in heart diseases are becoming worst. Due to heart diseases, approximately 1.75 crores people in India die every year, which is nearly 31% of all death worldwide [1],[2].

According to the estimate, there are 4 crores of heart patients in India among that 1.9 crores lives in the urban area and 2.1 crores reside in rural areas.

We are concerned to employ an efficient automatic detection of abnormal heartbeats (LBBB and RBBB) from ECG big data using a novel feature extraction technique. Instead of manually inferring the arrhythmias using ECG data with the help of medical expert or cardiologists, which may devour a lot of time and it may not be very accurate, a novel algorithm for fast, efficient and accurate detection of abnormal heartbeat in ECG signal is proposed. Automatic detection of the heartbeat will help cardiologist to diagnose cardiac disease (CD) and also assist them to save several lives by avoiding wrong diagnosis and medical errors.

ECG signal gives useful information to the cardiologists about the rhythm and functioning of the heart, ECG analysis represents a proficient approach to detect and care for different kinds of cardiac diseases [3], [4]. Figure 1 shows the normal heart rhythm (Normal ECG signal).



Fig. 1 Normal Electrocardiogram (ECG) Signal

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