A Comparative Study and Analysis on the Classification of ECG Signals

A Dissertation submitted towards the partial fulfillment
of the requirement for the award of degree of

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in
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Submitted by

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CERTIFICATE

This is to certify that the dissertation title "**A Comparative Study and Analysis on the Classification of ECG Signals**" submitted by **Mr. SAHIL DALAL, Roll. No. 2K14/SPD/16**, in partial fulfilment for the award of degree of Master of Technology in "**Signal Processing and Digital Design (SPDD)",** run by Department of Electronics & Communication Engineering in Delhi Technological University during the year 2014-2016., is a bonafide record of student's own work carried out by him under my supervision and guidance in the academic session 2015-16. To the best of my belief and knowledge the matter embodied in dissertation has not been submitted for the award of any other degree or certificate in this or any other university or institute.

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DECLARATION

I hereby declare that all the information in this document has been obtained and presented in accordance with academic rules and ethical conduct. This report is my own work to the best of my belief and knowledge. I have fully cited all material by others which I have used in my work. It is being submitted for the degree of Master of Technology in Signal Processing & Digital Design at the Delhi Technological University. To the best of my belief and knowledge it has not been submitted before for any degree or examination in any other university.

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ABSTRACT

Electrocardiogram (ECG) is a method used to measure the rate and regularity of heartbeats. Comparison of overall ECG waveform pattern and shape enables doctors to diagnose possible diseases. Currently there is computer based analysis which employs certain signal processing to diagnose a patient based on ECG recording. Signal processing usually takes the form of a transformation of a signal into another signal that is in some sense more desirable than the original.

The purpose of this research is to address in identifying the Normal, Apnea, Tachycardia and Ischemia signals using the method of Principal Component Analysis (PCA) and various classifiers i.e. Support Vector Machine (SVM), Artificial Neural Networks (ANN), Fuzzy Logic and a hybrid of ANN and Fuzzy Logic called as Neuro-Fuzzy Logic. PCA algorithm is used to extract the relevant information from the ECG input data which are their P-QRS-T parameters values. Then the extracted features data is analyzed and classified using Support Vector Machine (SVM), Artificial Neural Networks (ANN), Fuzzy Logic and a hybrid of ANN and Fuzzy Logic called as Neuro-Fuzzy Logic classifiers.

The proposed algorithm is implemented and also tested in MATLAB software. The ECG signal are being selected and tested from PhysioNet Database using MIT-BIH Arrhythmia Database. Among the classifiers utilized during this project, Neuro-Fuzzy classifier successfully classifies the Normal, Apnea, Tachycardia and Ischemia signals with the rate of accuracy is 95.83%. The analysis system also can be achieved

using rest of the classifiers such as Fuzzy Logic, ANN and SVM with accuracies of 91.70%, 87.50% and 85.40% respectively for each sample tested of Normal, Apnea, Tachycardia and Ischemia classes proposed.

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