Cairo University

AUTOMATIC ARRHYTHMIA DETECTION USING SUPPORT VECTOR MACHINE BASED ON DISCRETE WAVELET TRANSFORM

By

Eng. Ibrahim Hamed Ibrahim

A Thesis Submitted to the
Faculty of Engineering, Cairo University
In Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE

In

Systems and Biomedical Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Title of Thesis:

Automatic Arrhythmia Detection Using Support Vector Machine Based On Discrete Wavelet Transform

Key Words:
Arrhythmia detection ;Wavelet; Principal component analysis; Support vector machine

Summary:

Arrhythmia is abnormality in the way electricity moves through the heart. The symptoms of arrhythmia are not present all the time; several examination hours of ECG records are needed to detect these symptoms. Even so, there is a high percentage of missing vital information. Automated arrhythmia detection of normal sinus rhythm and three types of arrhythmia (atrial fibrillation, ventricular fibrillation, and supra ventricular tachycardia) was introduced by extracting the main features that contain both frequency and location information of the signal through discrete wavelet transform followed by principal component analysis. These features were reduced through statistical analysis to be used as input to support vector machine with optimized parameters that resulted in overall accuracy of 96.89%. The aim is to minimize the risk of missing vital information and to give physicians the confidence of making correct decisions with indistinct symptoms.

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Dedication

The last word must again go to my wife **Reham Atef** ,who, supported me along my research by relieving all the load on me and taking the responsibility without any complaint, thanks my wife.

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Nomenclature

AF	Atrial Fibrillation
A.V.B	Atrio-ventricular Bundle
A.V	Atrio-ventricular
BPM	Beat Per Minute
CWT	Continuous Wavelet Transform
DWT	Discrete wavelet transform
ECG	Electrocardiograph
EMD	Empirical Mode Decomposition
IMF	Intrinsic Mode Function
FIR	Finite Impulse Response
IIR	Infinite Impulse Response
IQR	Inter Quartile Range
KNN	K-Nearest Neighbor
L.B.B	Left Bundle Branch
LDA	Linear Discriminant analysis
MATLAB	Matrix Laboratory
MLP	Multi-Layer Perceptron
MRI	Magnetic Resonance Imaging
OAA	One Against All.
OAO	One Against One.