**VISVESVARAYA TECHNOLOGICAL UNIVERSITY**

**BELGAUM – 590014**

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**A Project Report on**

**A REAL TIME APPLICATION TO IDENTIFY CHRONIC ALCOHOLICS FROM ECG SIGNALS**

**Submitted in partial fulfilment of the requirement for the award of degree of**

**BACHELOR OF ENGINEERING**

**IN**

**ELECTRONICS AND COMMUNICATION**

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**P.E.S. UNIVERSITY**

**(An Autonomous Institute under VTU, Belgaum)**

**BENGALURU - 560085**

**DECLARATION**

We hereby declare that the project report entitled “**A REAL TIME APPLICATION TO IDENTIFY CHRONIC ALCOHOLICS FROM ECG SIGNALS”** is the bonafide record of the project carried out at **P.E.S. Institute of Technology** in partial fulfilment of the requirements for the award of degree **Bachelor of Engineering** in **Electronics and Communication Engineering** of **Visvesvaraya Technological University, Belgaum** during the academic year 2017. We further declare that the project report is not submitted to any other universities in fulfilment of the requirements for the award of any degree.

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**CERTIFICATE**

This is to certify that the project titled **A REAL TIME APPLICATION TO IDENTIFY CHRONIC ALCOHOLICS FROM ECG SIGNALS** is a bonafide work carried out by **Akarsh N. Kolekar, Apoorv Vatsal** and **Rakshith Vishwanatha** bearing University Seat Number **1PI13EC009, 1PI13EC017 and 1PI13EC075** respectively in partial fulfilment for the award of **Bachelor of Engineering** in **Electronics and Communication** from the **Visvesvaraya Technological University**, Belgaum during the academic year 2017. It is certified that all correction/suggestions indicated for internal assessment have been incorporated in the report deposited in the department library. The project report has been approved as it satisfies the academic requirements with respect to the project work prescribed for the said degree.

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**ABSTRACT**

Several medical studies reveal alcohol consumption has pronounced effects on the physiology of the consumer. These physiological changes can be seen in the heart rate variability (HRV) of the consumer. In this project the electrocardiogram (ECG) signal of a test subject is captured using an ECG sensor and noise present in the captured signal is filtered out using software techniques. The processed signals are then used to classify the subject as a chronic alcoholic or a normative person using machine learning algorithms on features extracted though HRV analysis.

ECG samples of chronically alcoholic subjects and normative subjects to train the classification system have been collected from a medical centre. To these signals once HRV analysis is performed, time domain, frequency domain, and non-linear features are extracted. The features extracted are fed to machine learning algorithms to enable the algorithms to classify subjects into alcoholic or normative classes. For this classification problem, Support Vector Machines (SVM) and Extreme Learning Machines (ELM) have been trained, and validated using k-fold cross validation.

Time domain, frequency domain and non-linear features are generally the types of features extracted from ECG signals using HRV analysis. Use of such features provided good accuracies for the classifiers however, to further improve the accuracy of the SVM and ELM models, a new set of features obtained from Autoregressive Modelling (using Exogenous Inputs) have also been used. A comparative study has been made between both the algorithms in the two cases where the usual time domain, frequency domain and non-linear features were used to train the classifiers, to the case when the autoregressive model coefficients were also included with the feature set.

One of the key ideas of the project was to develop a system that could capture the ECG signal of the test subject, perform pre-processing on the signal, extract features via HRV analysis and classify the subject then and there in real time. A Raspberry Pi was used to make the required portable standalone system.

**Table of Contents**

CHAPTER -1 INTRODUCTION 01

1.1 Introduction01

1.2 Problem Statement 03

1.3 Objective04

1.4 Proposed Methodology04

CHAPTER- 2 LITERATURE SURVEY 06

CHAPTER- 3 METHODOLOGY 11

3.1 Introduction11

3.2 Hardware 11

3.2.1 ECG Sensor Circuit Design 11

3.2.2 Heart Rate Monitor (AD8232) 17

3.2.3 Raspberry-Pi 19

3.2.4 Analog to Digital Converter (ADC)20

3.2.5 Integration of Hardware 21

3.2.5.1 Setting Up Raspberry-Pi 21

3.2.5.2 Connecting Heart Rate Monitor to Raspberry-Pi23

3.2.6 Communication Protocols23

3.3. Software 25

3.3.1 Dataset Description26

3.3.2 Pre-Processing26

3.3.2.1 Infinite Impulse Response27

3.3.2.2 Wavelet Transforms29

3.3.3 Feature Extraction37

3.3.3.1 Time Domain 37

3.3.3.2 Non-Linear 39

3.3.3.3 Frequency Domain 40

3.3.3.4 Auto-Regressive Modelling (with Exogenous Input)42

3.4 Classifiers 46

3.4.1 Support Vector Machine (SVM)46

3.4.2 Extreme Learning Machine (ELM)52

3.4.3 Validation56

3.4.3.1 Leave One out Validation57

3.4.3.2 K-fold Validation58

3.4.3.3 Confusion Matrices58

3.5 Real Time application 59

3.5.1 Tkinter 60

3.5.2 Graphical User Interface 61

CHAPTER- 4 RESULTS AND DISCUSSION 63

4.1 Results of Pre-processing 63

4.2 Results of Feature extraction 64

4.3 Results of SVM 64

4.4 Results of ELM 65

4.5 Comparative Study67

POINTS OF DISCUSSION 67

CONCLUSION AND FUTURE WORK 68

REFERENCES 69

APPENDIX72

**List of Figures**

Fig 2.1 Schematic Representation of ECG Waveform07

Fig 2.2 Architecture of an Extreme Learning Machine09

Fig 3.1 Traditional placement of ECG probes12

Fig 3.2 Circuit Design-112

Fig 3.3 Circuit Design-2 14

Fig 3.4 Superposed Output – with Probe Connection to Limbs14

Fig 3.5 50Hz Output without Probes Connected to Limbs 15

Fig 3.6 Circuit Design-3 16

Fig 3.7 Soldered Circuit 16

Fig 3.8 AD8232 17

Fig 3.9 Internal Pin Diagram of AD8232 18

Fig 3.10 Raspberry Pi 2 model B 19

Fig 3.11 MCP 3008 ADC 20

Fig 3.12 MCP 3008 interface to Raspberry Pi 23

Fig 3.13 Synchronous Data Bus 24

Fig 3.14 Sending and receiving data using SPI 24

Fig 3.15 Baseline Wandering and Power-line noise in ECG 27

Fig 3.16 PSD of a sample ECG signal with noise components 28

Fig 3.17 IIR Filtered Signal without Baseline Wandering 29

Fig 3.18 Diagrammatic Representation of Fourier Transform applied to a Signal 29

Fig 3.19 Diagrammatic Representation of Short Fourier Transform applied to a Signal 30

Fig 3.20 Sine wave and a Mother Wavelet 31

Fig 3.21 Wavelet Decomposition of a Signal 31

Fig 3.22 Wavelet decomposition into high and low frequencies 32

Fig 3.23 Wavelet Decomposition Tree 33

Fig 3.24 Mother wavelet 33

Fig 3.25 Wavelet Decomposition in different modes 34

Fig 3.26 Decomposition in Tree mode 35

Fig 3.27 Complete Wavelet Decomposition 35

Fig 3.28 Removal of Baseline Wandering 36

Fig 3.29 Poincare Plot 40

Fig 3.30 PSD of a sample from dataset used 41

Fig 3.31 MATLAB Toolbox to select order of ARX polynomial 44

Fig 3.32 ARX model structure selection 44

Fig 3.33 Coefficients of ARX model fit 45

Fig 3.34 Importance of regularization 50

Fig 3.35 Count of C and sigma used 52

Fig 3.36 Accuracy for a range of hidden neurons 56

Fig 3.37 Real time capture of ECG signal 60

Fig 3.38 GUI 61

Fig 3.39 ECG signal loading process is started61

Fig 3.40 ECG signal loaded 62

Fig 3.41 Feature extraction completed 62

Fig 3.42 Classification completed 62

Fig4.1 Removal of Baseline Wandering and RR peak detection 63

**List of Tables**

Table 3.1 GPIO pins of Raspberry Pi 23

Table 3.2 Confusion Matrix 59

Table 4.1 Results of SVM for different feature sets 64

Table 4.2 Confusion matrix for SVM with ARX features 65

Table 4.3 Accuracies of ELM for different feature sets 66

Table 4.4 Accuracy of ELM for Leave One Out Validation with ARX order 5 66

Table 4.5 Confusion matrix for ELM with ARX features order 5 66

Table 4.6 Comparative results of SVM and ELM 67

Table 4.7 Comparative Sensitivity and Specificity of SVM and ELM 67