**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. INSTITUTE OF TECHNOLOGY**

**(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**

1.1 Introduction ......................................................................................................................

1.2 Problem Statement ............................................................................................................

1.3 Objective............................................................................................................................

1.4 Proposed Methodology …..............................................................................................

**CHAPTER- 2 LITERATURE SURVEY**

**CHAPTER- 3 METHODOLOGY**

3.1 Introduction .................................................................................................................

3.2 Hardware......................................................................................................................

3.2.1 ECG Sensor Circuit Design

3.2.2 Heart Rate Monitor (AD8232)

3.2.3 Raspberry-Pi

3.2.4 Analog to Digital Converter (ADC)

3.2.5 Integration of Hardware

3.2.5.1 Setting Up Raspberry-Pi

3.2.5.1 Connecting Heart Rate Monitor

3.2.6 Communication Protocols

3.3. Software...............................................................................

3.3.1 Dataset Description

3.3.2 Pre-Processing

3.4.2.1 Infinite Impulse Response

3.4.2.2 Wavelet Transforms

3.3.3 Feature Extraction

3.3.3.1 Time Domain

3.3.3.2 Non-Linear

3.3.3.3 Frequency Domain

3.3.3.4 Auto-Regressive Modelling (with Exogenous Input)

3.4 Classifiers

3.4.1 Support Vector Machine (SVM)

3.4.2 Extreme Learning Machine (ELM)

3.4.3 Validation

3.4.3.1 Leave One out Validation

3.4.3.2 K-fold Validation

3.4.3.3 Confusion Matrices

3.5 Real Time application

3.5.1 Tkinter

3.5.2 Graphical User Interface

**CHATER-4 RESULTS AND DISCUSSION ........................................................................**

4.1 Results of Pre-processing

4.2 Results of Feature extraction

4.3 Results of SVM

4.4 Results of ELM

4.5 Comparative Study

**5. POINTS OF DISCUSSION**

**6. CONCLUSION AND FUTURE WORK**

**7. REFERENCE**

**9. APPENDIX**

**List of Figures**

Fig 2.1 Schematic Representation of ECG Waveform…………

Fig 2.2 Architecture of an Extreme Learning Machine…………

Fig 3.1 Traditional placement of ECG probes …………………………………….

Fig 3.2 Circuit Design-1.......................................................................................

Fig 3.3 Circuit Design-2

Fig 3.4 Superposed Output – with Probe Connection to Limbs …………………

Fig 3.5 50Hz Output without Probes Connected to Limbs

Fig 3.6 Circuit Design-3

Fig 3.7 Soldered Circuit

Fig 3.8 AD8232

Fig 3.9 Internal Pin Diagram of AD8232

Fig 3.10 Raspberry Pi 2 model B

Fig 3.11 MCP 3008 ADC

Fig 3.12 MCP 3008 interface to Raspberry Pi

Fig 3.13 Synchronous Data Bus

Fig 3.14 Sending and receiving data using SPI

Fig 3.15 Baseline Wandering and Power-line noise in ECG

Fig 3.16 PSD of a sample ECG signal with noise components

Fig 3.17 IIR Filtered Signal without Baseline Wandering

Fig 3.18 Diagrammatic Representation of Fourier Transform applied to a Signal

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

Fig 3.20 Sine wave and a Mother Wavelet

Fig 3.21 Wavelet Decomposition of a Signal

Fig 3.22 Wavelet decomposition into high and low frequencies

Fig 3.23 Wavelet Decomposition Tree

Fig 3.24 Mother wavelet

Fig 3.25 Wavelet Decomposition in different modes

Fig 3.26 Decomposition in Tree mode

Fig 3.27 Complete Wavelet Decomposition

Fig 3.28 Removal of Baseline Wandering by Wavelet Decomposition and RR peak detection

Fig 3.29 Poincare Plot

Fig 3.30 PSD of a sample from dataset used

Fig 3.31 MATLAB Toolbox to select order of ARX polynomial

Fig 3.32 ARX model structure selection

Fig 3.33 Coefficients of ARX model fit to required order and input/output signals provided

Fig 3.34 Importance of regularization

Fig 3.35 Accuracy for a range of hidden neurons

Fig 3.36 Real time capture of ECG signal

Fig 3.37 GUI

Fig 3.38 ECG signal loading process is started

Fig 3.39 ECG signal is loaded

Fig 3.40 Feature extraction completed

Fig 3.41 Classification completed

**List of Tables**

Table 3.1 GPIO pins of Raspberry Pi

Table 3.2 Confusion Matrix

Table 4.1 Results of SVM for different feature sets

Table 4.2 Confusion matrix for SVM with ARX features

Table 4.3 Accuracies of ELM for different feature sets

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

Table 4.5 Confusion matrix for ELM with ARX features order 5

Table 4.6 Comparative results of SVM and ELM

Table 4.7 Comparative Sensitivity and Specificity of SVM and ELM