VISVESVARAYA TECHNOLOGICAL UNIVERSITY

BELGAUM – 590014

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

By

Akarsh N Kolekar	**[1PI13EC009]**
Apoorv Vatsal	**[1PI13EC017]**
Rakshith Vishwanatha	**[1PI13EC075]**

Under the Guidance of:

Dr. B. Niranjana Krupa

Professor, Dept. of ECE,

PES University

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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.

By

AKARSH N. KOLEKAR **(1PI13EC009)**

APOORV VATSAL **(1PI13EC017)**

RAKSHITH VISHWANATHA **(1PI13EC075)**

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

BELGAUM – 590014

PES UNIVERSITY
(An Autonomous Institute under VTU, Belgaum)
BENGALURU – 560085

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.

Guide:

Dr. B. Niranjana Krupa
Dept. of ECE.
PES University,
Bengaluru – 560085

Head of Department:

Dr.ChandarTS
Dept. of ECE
PES University,
Bengaluru – 560085

Principal :
Dr. K S Sridhar
PES University,
Bengaluru – 560085

External Viva:
Name of the Examiner Signature with Date
1.
2.

ACKNOWLEDGEMENT

The satisfaction and euphoria that accompany the successful completion of any task would be incomplete without the mention of people who made it possible, whose constant guidance and encouragement crown all the efforts with success.

Our most sincere and grateful acknowledgement to the P.E.S Institute of Technology for providing us with the opportunity to pursue our degree and thus helping us in shaping our career.

We would like to thank our project guide, **Dr. B. Niranjana Krupa,** Professor at the Department of Electronics and Communication Engineering for her continuous valuable guidance, advice and persistent encouragement throughout the project work.

We want to thank **Dr. T. S. Chandar,** Head of the Department Electronics and Communication, for his encouragement and support throughout the project work.

We are thankful to **Dr. Sridhar K. S.** , Principal of PES University, Bengaluru for his encouragement and supporting our endeavour.

We would also like to thank all the non-teaching staff and management of PES University, Bengaluru for their cooperation.

Last but not the least we wish to thank our family and friends for all their love support and encouragement.

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.

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