SAVITRIBAI PHULE PUNEUNIVERSITY

APRELIMINARYPROJECTREPORTON

"Health Monitoring and Stress Detection System"

SUBMITTED TOWARDS THE
PARTIAL FULFILLMENT OF THE REQUIREMENTS OF

BACHELOR OF ENGINEERING (Computer Engineering)

BY

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Under The Guidance of
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IMPERIAL COLLEGE OF ENGINEERING AND RESEARCH,

WAGHOLI, PUNE 412 207

2020-21

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CERTIFICATE

This is to certify that the Project Entitled

Health Monitoring and Stress Detection

Submitted by

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is a bonafide work carried out by Students under the supervision of DR. NILESH SABLE and it is submitted towards the partial fulfillment of the requirement of Bachelor of Engineering (Computer Engineering)Project.

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Abstract

Stress detector, is a system that measures stress level of a human being who is known to be under stress. This method has the potential to be precise and smoother. Stress brings negative consequences such as decreases in level of concentration, mental health issues such as anxiety and depression as well as ineffective ways of coping, such as substance abuse. In the market, there are smart phone's apps where people can hold a finger to the camera, which will then detect slight changes in color related to blood flow. If a person is able to recognize when they get stress and what they get stress from, it will be helpful for them to find ways to relieve it. It is our intention to address these gaps in the market and create a system that will be beneficial to a great many patients and health care practitioners by better assisting them by taking control of an elevated physiological response that has many negative health consequences. Through this project we aim to understand the various conditions that lead to stress, find suitable parameters to measure and detect it using arduino and detecting stress by camera of laptop. This project describes our efforts and results in answering these questions. The most popular physiological markers of stress are as follows: Galvanic skin response (GSR); Electromyogram(EMG);Skintemperature;ECG;HRV.

Acknowledgments

*It gives us great pleasure in presenting the preliminary project report on **''Health Monitoring and Stress Detection''** and to express our deep regards towards those who have offered their valuable time and guidance in our hour of need.*

*We would like to take this opportunity to thank my internal guide **Dr. Nilesh Sable** for giving me all the help and guidance we needed. We are really grateful to them for their kind support. Their valuable suggestions were very helpful.*

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Saurabh Dombe
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CHAPTER 1

SYNOPSIS

1.1 PROJECT TITLE

Health Monitoring and Stress Detection System

1.2 PROJECT OPTION

This is College internal Project performed by group member under Guidance

1.3 PROJECT GUIDE

Dr. Nilesh Sable

1.4 TECHNICAL KEYWORDS (AS PER ACM KEYWORDS)

Arduino, python, ECG, HR sensor, webcam, face detection algorithms.

- Computer Science
- Open source
- Hardware & Software
- Algorithms
- Mobile communication
- Data preprocessing & Analysis

1.5 PROBLEM STATEMENT

Problem statement: In today's stressful life people are revolving around their work 24 hours of clock. Due to this man y physical and psychological problems are arising in every second person. And the drawback of this system is human is prone to stress and subsequently creating threats to his own life by many ways including suicide or depression. But till we identify and work around for the issue we get late and person fall into illness of the problem. Our purpose is to keep track of human stress parameters (biological) by physical sensors and his expressions by camera integrated into his working laptop. The belt or strip on his chest or wrist monitoring parameters like ECG and HR signal to check hi heartbeat variation and his facial expression for mood detection. All this data is processed in Machine learning algorithm and application program in dedicated open source computer called Arduino. Based on results an early detection of odd state is identified.

1.6 ABSTRACT

Stress detector, is a system that measures stress level of a human being who is known to be under stress. This method has the potential to be precise and smoother. Stress brings negative consequences such as decreases in level of concentration, mental health issues such as anxiety and depression as well as ineffective ways of coping, such as substance abuse. In the market, there are smart phone's apps where people can hold a finger to the camera, which will then detect slight changes in color related to blood flow. If a person is able to recognize when they get stress and what they get stress from, it will be helpful for them to find ways to relieve it. It is our intention to address these gaps in the market and create a system that will be beneficial to a great many patients and health care practitioners by better assisting them by taking control of an elevated physiological response that has many negative health consequences. Through this project we aim to understand the various conditions that lead to stress, find suitable parameters to measure and detect it using arduino and detecting stress by camera of laptop. This project describes our efforts and results in answering these questions. The most popular physiological markers of stress are as follows: Galvanic skin response (GSR); Electromyogram (EMG); Skin temperature; ECG; HRV

1.7 GOALS AND OBJECTIVES

Stress detection of person under test in normal working conditions like working at home or office. Early detection of severe stress state to give signal to avoid any further consequences which may result due to depression. For this reason an objective is to build a contact plus contactless safety and alert system which can process human data and provide necessary prevention to human falling into depression later. It helps to avoid any harsh decision could be possibly taken by person going through same state of mind.

1.8 RELEVANT MATHEMATICS ASSOCIATED WITH THEPROJECT

System Description:

- Input: ECG, HR sensor data, facial expression images through webcam
- Output: algorithms output for Normal or stressed state, happy or unhappy state

  Mobile alert or Email alert with siren beeps to alert bad condition
- Face recognition Library, face net, Emotion detection dataset
- ECG, HR data collected from sensor processed in code for decision making

- Failure Conditions: malfunctioning of sensors, insufficient data, or faulty images captured. Reset condition of processing microcomputer. Wireless signal issue.

- Success conditions: early mood/stress detection, fast sensor reading and processings.

1.9 NAMES OF CONFERENCES / JOURNALS WHERE PAPERS CAN BEPUBLISHED

- ICTACT **Journal** on Soft Computing.
- International **Journal** of Data Mining and Emergent Technologies.
- International **Journal** of Statistics and Applied Mathematics.
- International **Journal** of Scientific Research and Management (IJSRM)

1.10 REVIEW OF CONFERENCE/JOURNAL PAPERS SUPPORTING PROJECT IDEA

[1] O. K of man, N. Meiran, E. Greenberg, M. Balas, and H. Cohen, "Enhanced performance on executive functions associated with examination stress: Evidence from task-switching and Stroop paradigms," *Cognition & Emotion,* vol. 20, pp. 577-595, 2006.

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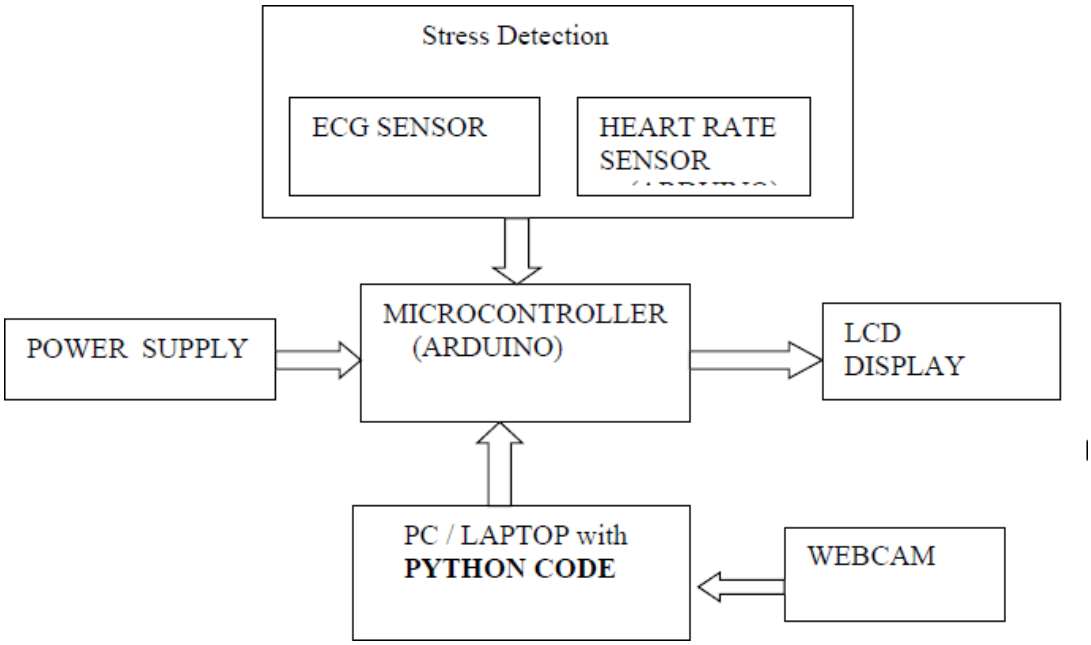
[10]Abdel-Hamid O, Deng L, Yu D. 2013. Exploring convolutional neural network structures and optimization techniques for face recognition.In Inter speech.1173--1175.

1.11 PLAN OF PROJECT EXECUTION



CHAPTER 2

TECHNICAL KEYWORDS

2.1 AREA OF PROJECT

Project Area: "Computer science- IOT and Data processing with vision physical sensors".
-Medical data processing, sensor data processing, smart IOT for mental and physical stress diagnose with alert system for any person in normal working conditions.

2.2 TECHNICAL KEYWORDS

- IOT – Internet of things
- Image preprocessing
- Image extraction
- Image classification
- Accuracy percentage
- Medical Signal Sensors
- Python Algorithms
- Camera Vision OR HRV analysis
- Machine learning classification

CHAPTER 3

INTRODUCTION

3.1 PROJECT IDEA

Our Basic Project idea is identifying and detecting human stress conditions by several ways like if the person is normally working on laptop at home or office his webcam will capture images and integrated python application will trigger Arduino minicomputer with result of captured image if the person is happy or sad. At the same time Arduino is connected with couple of sensor pair like ECG or HR sensor. The package of these sensor can be integrated in wrist belt or Chest belt. The signal are transmitted to or read at arduino. An application code running inside arduino is capable of taking decision based on all data together to decide whether the person is normal or at risk of stress. Is any odd condition of physical or mental health the alert signal is generated in terms of siren plus email or SMS/call

3.2 MOTIVATION OF THE PROJECT

Project motivation is raised from many incidents from past and especially from 2020 corona pandemic, in which many people unfortunately did suicides and finish their life.
If we can have some basic tools like these we can early attend these cases and avoid any misshapen to them.

3.3 LITERATURE SURVEY

Onder Yakut et al enact the ECG monitoring system using e-health sensor platform and raspberry pi as the development board. Moreover, a connection board developed by cooking hacks was used as an interface between e-health sensors shied an raspberry pi as the sensor was designed originally. For interfacing with arduino. The statistics obtained by electrodes was sent to the data base by using the software written C++ language. Jan aid Mohammed et a1 enact the android –based health monitoring system using Iot platform. This paper presents the information about required infrasra structure viz.IOIO 1microcontroller, communication protocols, data base management system and large file compression system. STEFANO Di pascoliet a1 developed low-power ECG monitoring system with a wearable facility. The focus of this development was to design a system with attributes viz. low cost, wearability, and low energy per bit. In this proposed system the ZigBee protocol was used for data transmission from sensor. This system used low power ADC developed by texas instrument (ADS1246).

Vital signs derive its significance from the fact that they can be considered as an indication of the person's health. Any change in the measurements of these signs indicates an abnormality in the physical condition of the patient. A considerable number of medical conditions can be detected from variations in one or more of the vital sign. The specialized devices for measuring the vital signs are not portable and can't be found anywhere. Hence, in this thesis, the concept of using an arm band (potable heart rate monitor) and mobile phone as a diagnosing tool

There are four vital signs which are standard in most medical settings:

1. Pulse rate.
2. Respiratory rate.
3. Blood pressure.
4. Body temperature.

Over the last two decades, researchers have significantly advanced human facial emotion recognition with computer vision techniques. Historically, there have been many approaches to this problem, including using pyramid histograms of gradients (PHOG), AU aware facial features, boosted LBP descriptors , and RNNs. However, 1 recent top submissions, to the 2015 Emotions in the Wild (EmotiW 2015) contest for static images all used deep convolutional neural networks (CNNs), generating up to 62% test accuracy. A recent development by G. Levi et. Al showed significant improvement in facial emotion recognition using a CNN. The authors addressed two salient problems: 1) a small amount of data available for training deep CNNs and 2) appearance variation usually caused by variations in illumination. They used Local Binary Patterns (LBP) to transform the images to an illumination invariant, 3D space that could serve as an input to a CNN. This special data preprocessing was applied to various publicly available models such as VGG S . The model was then re-trained on the large CASIA Web Face data-set and transfer learned on the Static Facial Expressions in the Wild (SFEW) dataset, which is a smaller database of labeled facial emotions released for the EmotiW 2015 challenge . Final results showed a test accuracy up to 54.56%, an improvement of 15% over baseline scores. Figure 2 visualizes the first convolutional layer of VGG S, revealing the different kernels optimized for feature detection. Since this modified VGG S neural network is pre-trained for facial recognition and freely available, we chose to use VGG S as a starting point in developing our own model. A notable implementation of a CNN to real-time detection of emotions from facial expressions is by S. Oullet . The author implemented a game, where a CNN was applied to an input video stream to capture the subject's facial expressions, acting as a control for the game. This work demonstrated the feasibility of implementing a CNN in real time by using a running-average of the detected emotions from the input stream, reducing the effects of variation and noise.

CHAPTER 4

PROBLEM DEFINITION AND SCOPE

4.1 PROBLEMSTATEMENT

Description of Problem: stress is part of health state and is a serious concern in today modern life style of work and eat. Along with that human is exposed to many such an odd things where he exposed to stress conditions which are harmful to his thought process towards life and some time he can fall into depressed state and can harm himself unfortunately. To avoid such a trauma we can aware our self to make use of advanced technologies to protect human lives from harm and damage. We design and utilize a small external health parameters reading, processing, analyzing and monitor as well as control system using available open source development platforms and tool. An hardware set as well as software application in laptop monitor persons heart signals, facial emotion to detect his current state of mind either good or bad and an alert signal is sent to known people via SMS, call, email.

4.1.1 Goals and objectives

- Real time monitoring of person mental health by facial images processing
- Reading health related data like heart pulse by ECG and HR sensor
- Applying suitable application code and algorithms to detect stress level
- Upon getting stress condition sending alert signal to known contacts via SMS, call, email or at least displaying on display with siren alert

4.1.2 Statement of scope

- Software used: C language application code for Arduino to read couple of sensors data. Processing, calibrating, analog to digital conversion .and getting expected results.

- Use of vision sensor like camera to capture live face images and processing in python with image processing tools and libraries.

- One more option is applicable in this format is to run machine learning code in laptop with trained data for ECG and HR signals. If person is equipped with sensors belts on wrist and chest using wireless technology data is fed to system and processed in code. Based on result and stress is detected and email is forwarded as alert.

- By combine effect of data from all sources a smart decision for stress situation of person is taken in less amount of time to generate alarm

- In scope of this system it is capable of getting closer to result as fast as possible and try to give more accuracy. This system is not mobile yet as applicable to only when

person is doing some work with its work stations and wears sensor sets manually as per his awareness.

4.2 SOFTWARECONTEXT

- The design is almost product applicable in its future upgraded version, at this stage system gives basic idea of hoe software context that how software design can smartly integrated into hardware along with open source platform on computers to make health monitoring product

4.3 MAJORCONSTRAINTS

- Major constraints are like software upgrading to machine learning level where it train itself for any person and dataset is not achievable yet. Hardware setup is in large volume initially and work on size miniaturize yet to be done.

4.4 METHODOLOGIES OF PROBLEM SOLVING AND EFFICIENCYISSUES

- The single problem can be solved by different solutions. This considers the performance parameters for each approach. Thus considers the efficiency issues.

4.5 SCENARIOINWHICHMULTI-CORE, EMBEDDEDAND DISTRIBUTED COMPUTINGUSED

The computer industry is driven by pursuit of ever increasing performance. From high-end customized special-purpose computing in networking, telecommunications, and avionics to low-power embedded computing in desktop computing, portable computing and video games, customers expect faster, more efficient, and more powerful products. However, single core products are showing a diminishing ability to increase product performance at pace with consumer desire. Multi core processing is recognized as a key component for continued performance improvements.

4.6 OUTCOME

- Outcome of the project: project outcome is implemented in two ways ECG, HR and face data is processed in machine learned trained data with live feeding of data samples to predict emotion or mood state and alert is displayed on GUI display a well as email is forwarded to alert the situation.

4.7 APPLICATIONS

· Applications of Project:

- This project is applicable for patients and severe mental medical conditions
- Office working people for long working hours
- Students appearing for exams
- Officials who work under major work load conditions

4.8 HARDWARE RESOURCESREQUIRED

Sr. No.	Parameter	Minimum Requirement	Justification
1	CPU Speed	2 GHz	Remark Required
2	RAM	3 GB	Remark Required

Table 4.1: Hardware Requirements

4.9 SOFTWARE RESOURCES REQUIRED

Platform :

1. **OperatingSystem:** Windows 10

2. **IDE:**Pycharm, Arduino IDE

3. **Programming Language:** C based python and libraries , C based Arduino with libraries

CHAPTER 5

PROJECT PLAN

5.1 PROJECTESTIMATES

5.1.1 Reconciled Estimates

5.1.1.1 Cost Estimate : Arduino: 2000/-sensors: ECG: 1000/-, HR:800/-LCD: 300/- spare parts : 1000/-

5.1.1.2 Time Estimates: Software development: 2 month, hardware: 15 days

5.1.2 Project Resources

Project resources [People, Hardware, Software, Tools and other resources] based on

Memory Sharing, IPC, and Concurrency derived using appendices to be referred.

People: our own friends with technical expertise, our honorable guide

Hardware: controllers, sensors, displays and other spare parts including packaging and assembly including laptop.

Software: open source python tool and libraries, python IDE, training algorithms packages.

Other resources: Internet data and books

5.2 RISK MANAGEMENT W.R.T. NP HARD ANALYSIS

Risk is a possibility of loss or injury. Risk management is the identification assessment and prioritization of risks followed by coordinated and economical application of resources to minimize and control that would probability and impact of unfortunate events or to maximize the realization of opportunities. Risk can come from uncertainty in financial markets, project failures (at any phase in design, development, production and sustainment life cycles), legal liabilities, credit risks, accidents, natural causes and disasters as well deliberate attack from an advisory of uncertain and unpredictable cause.

Using risk management techniques we alleviate the harm or laws n software project or risk cannot be avoid but by perform in risk management we can attempt to ensure that right risks are taken at right time. Risk taking is essential to progress and failure is often key part of learning.

5.2.1 RiskIdentification

For risks identification, review of scope document, requirements specifications and schedule is done. Answers to questionnaire revealed some risks. Each risk is categorize

dasper the categories mentioned in[1].Please refer table 5.1for all the risks.

Top software and customer managers formally committed to support the project

End-usersenthusiasticallycommittedtotheprojectandthesystem/product to be built

Requirements fully understood by the software engineering team and its customers

Customers have been involved fully in the definition of requirements

End-users have realistic expectation

The software engineering team have the right mix of skills

Project requirements were not mush stable

The number of people on the project team adequate to do the job

All customer/user constituencies agree on the importance of the project and on the requirements for the system/product to be built.

5.2.1 Risk Analysis

The risks for the Project can be analyzed within the constraints of time and quality

ID	Risk Description	Probability	Impact		
			Schedule	Quality	Overall
1	Both end software	Low	Low	High	High
2	One side hardware	Low	Low	High	High

Table 5.1: Risk Table

Probability	Value	Description
High	Probability of occurrence is	>75%
Medium	Probability of occurrence is	26 – 75%
Low	Probability of occurrence is	<25%

Table 5.2: Risk Probability definitions [1]

Impact	Value	Description
Very high	>10%	Schedule impact or Unacceptable quality
High	5 – 10%	Schedule impact or Some parts of the project have low quality
Medium	<5%	Schedule impact or Barely noticeable degradation inequality Low Impact on schedule or Quality can be incorporated

Table 5.3: Risk Impact definitions [1]

5.2.3Overview of Risk Mitigation, Monitoring, Management

Following are the details for each risk.

Risk ID	1
Risk Description	Python based machine learning emotion/stress detection work
Category	Python, Pycharm IDE
Source	Python libraries, python language and ML datasets
Probability	Low
Impact	High
Response	Mitigate
Strategy	Strategy
Risk Status	Occurred

Risk ID	2
Risk Description	Hardware and software integration as IOT or Embedded work
Category	Controllers, Arduino, sensors, Displays, buzzer unit
Source	Software Design Specification documentation review.
Probability	Low
Impact	High
Response	Mitigate
Strategy	Better testing will resolve this issue.
Risk Status	Identified

Risk ID	3
Risk Description	Machine learning accuracy each time and sensor calibrations
Category	Data science and std algorithms modules, sensor moduels
Source	This was identified during early development and testing.
Probability	Low
Impact	Very High
Response	Accept
Strategy	Example Running Service Registry behind proxy balancer
Risk Status	Identified

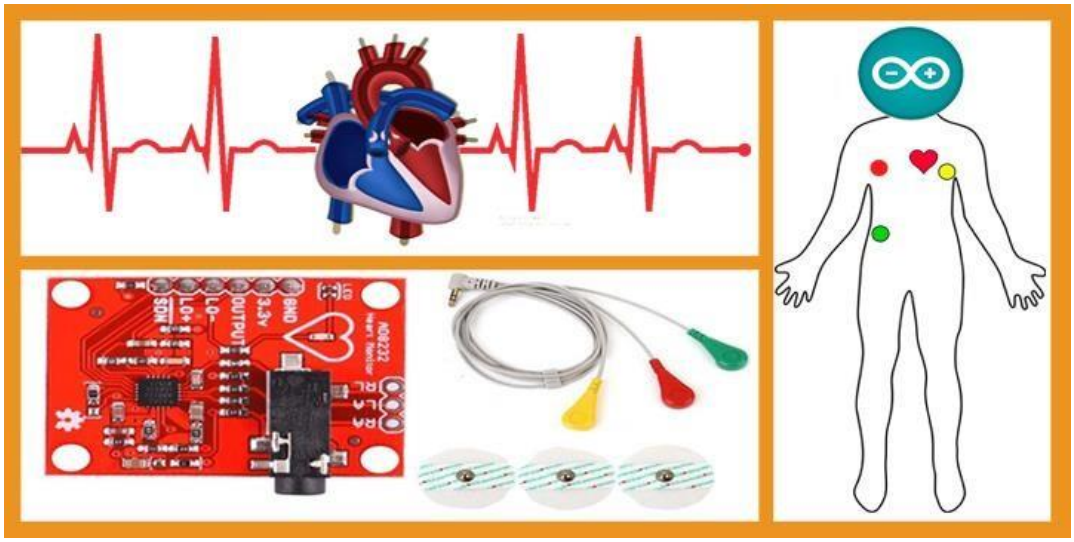
5.3 PROJECTSCHEDULE

5.3.1 Project taskset

Major Tasks in the Project stages are:

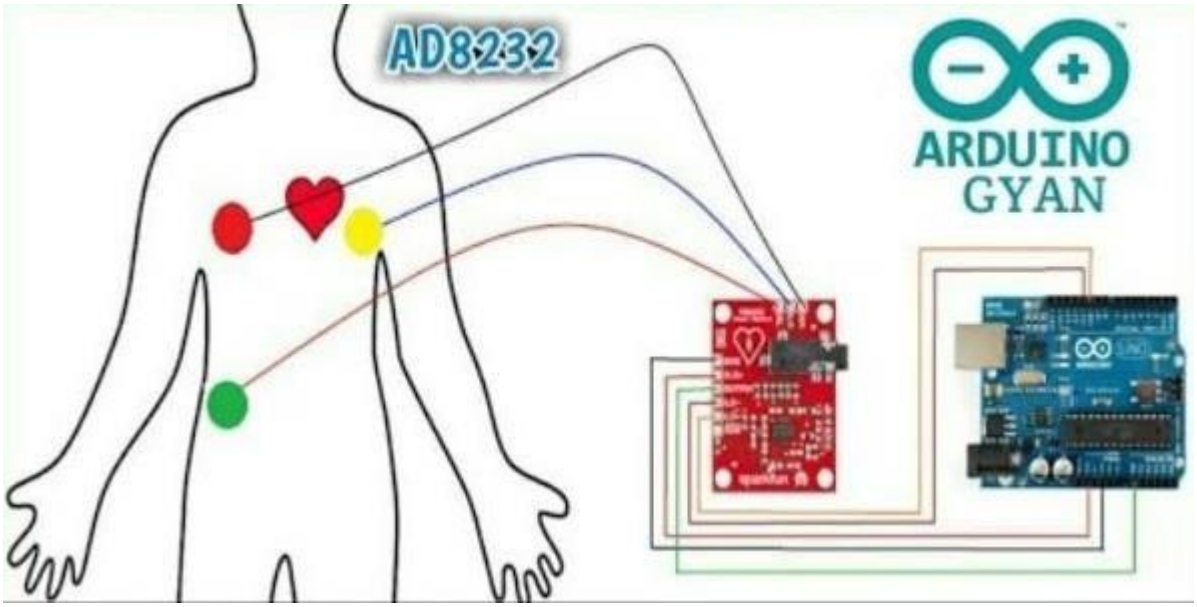
- Task1: Python coding basics, Algorithm selection for machine learning, testing and training data.
- Task2: installation of IDE's Arduino, Pycharm and modules for python
- Task3: selection of hardwares and coding with integration and testing results.
- Task4: Recording or logging results in each run
- Task5: locating faults and studying results which are close to probable output.

5.3.2Task network



Project task: sensor and modules selection. Mounting and safety norms
Software and IDE selections for code development work

Dependencies: stable Pulse rate for ECG sensors
Hardware accuracy and normal human body conditions, coding skills and timeline development of software for suitable testing



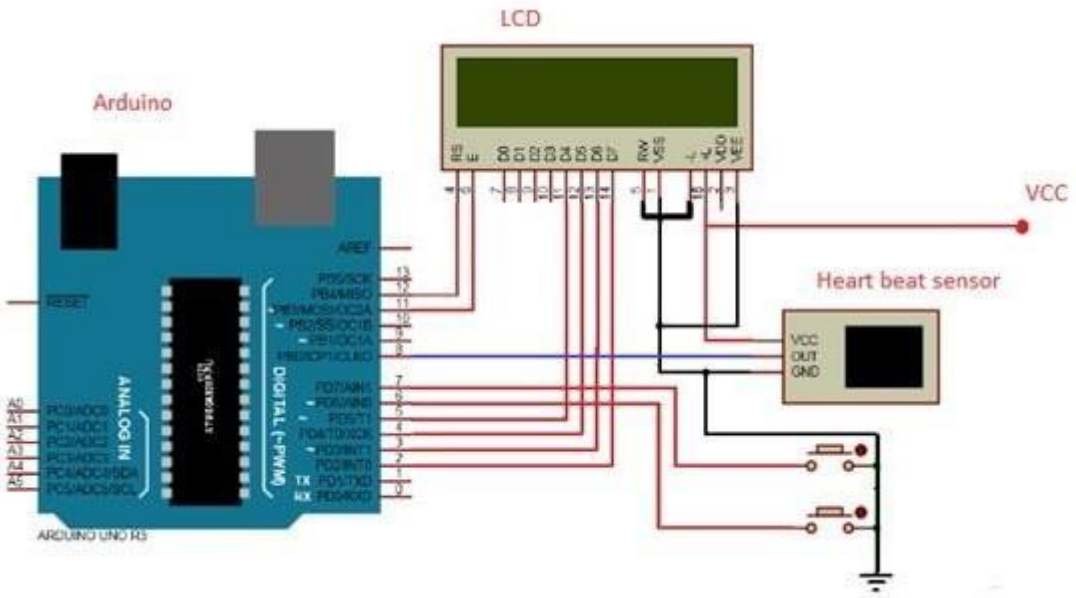


Fig: Hardware Structure of Project

5.4 TEAM ORGANIZATION

The manner in which staff is organized and the mechanisms for reporting are noted.

Sr.No	Design/Develop	Name of Designers/Developers
1	Design	1. Saurabh Dombe 2. Bhishma Khandare 3. Samadhan Kolekar 4. Mahesh Shegokar
2	Backend	1. Saurabh Dombe 2. Bhishma Khandare 3. Samadhan Kolekar 4. Mahesh Shegokar
3	Front end	1. Saurabh Dombe 2. Bhishma Khandare 3. Samadhan Kolekar 4. Mahesh Shegokar
4	Documentation	1. Saurabh Dombe 2. Bhishma Khandare 3. Samadhan Kolekar 4. Mahesh Shegokar
5	Testing	1. Saurabh Dombe 2. Bhishma Khandare 3. Samadhan Kolekar 4. Mahesh Shegokar

5.4.3 Team structure

The team structure for the project is identified. Roles are defined Team members are decided to form team structure. Different ideas are explored in major discussions and debates. Support from guide is fetched for clearing doubts and adding new features in presented basic ideas. Support from internet is taken to add for technical features and development skill sets for open source platforms. Roles are defined as per the aptitude and skill sets of an individual members in team.

Software responsibility shared in group of two and hardware to an individual for better development and faster results.

5.4.4 Management reporting and communication

.

- Every phase of project task development is maintained and monitored in log books as record for correction and updating further work of development in parts.
- Sharing ideas and concepts by email or messages. Weekly reporting to guide on project session day at lab hours.
- Inter and intra team communication protocol for project updates
- Weekly timetable for project review is designed for greater work efforts around project task
- Project Guide communication established through email for each update on project development.
- Assessment sheet and log book collectively utilized for project report writing

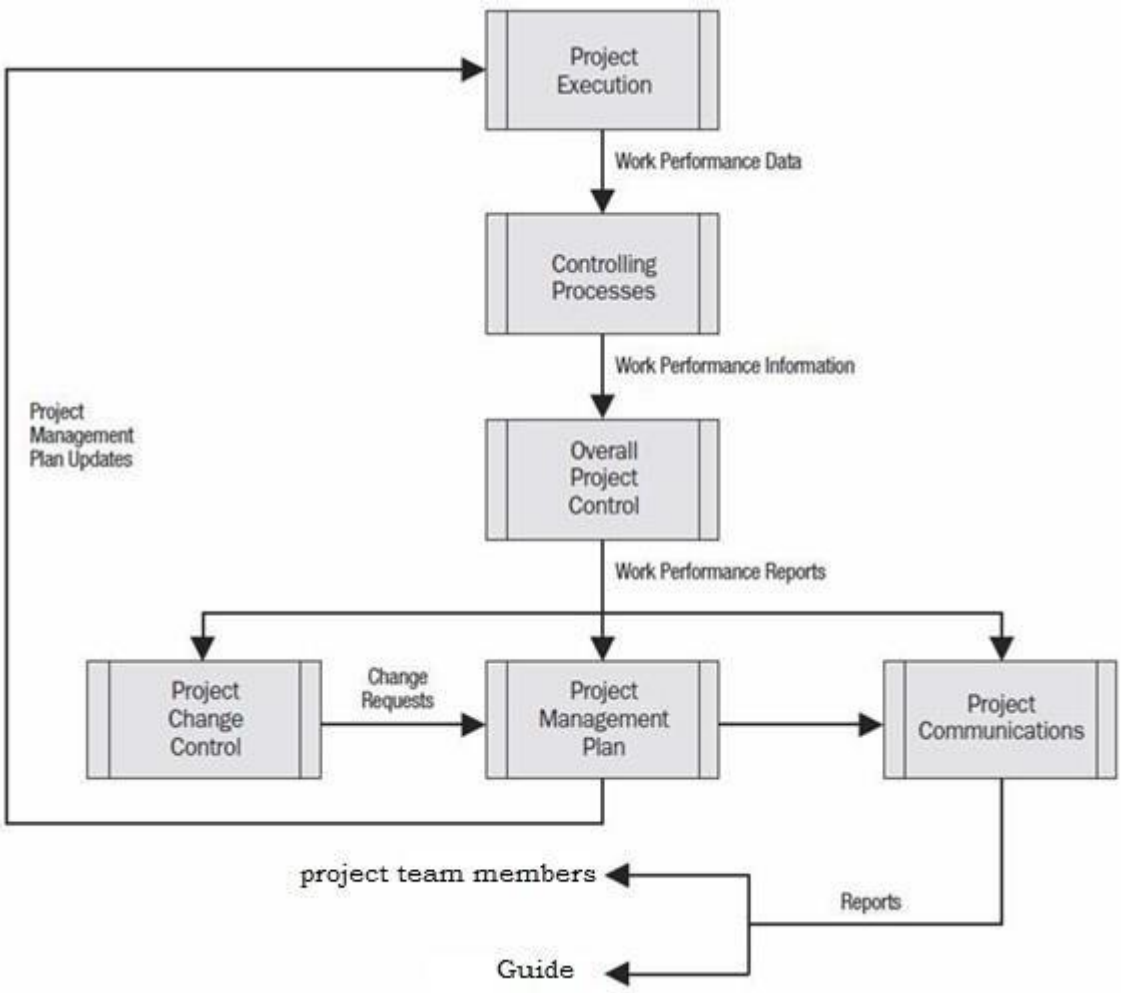


Fig: Management reporting and Communication

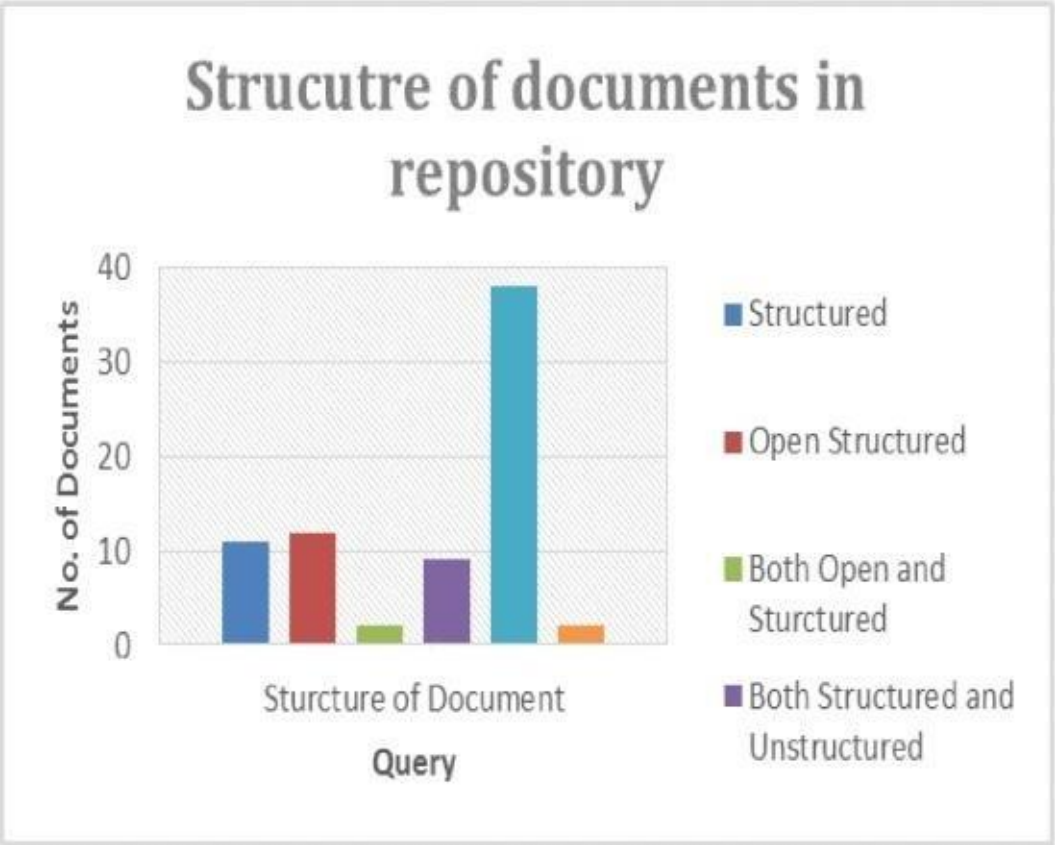
CHAPTER 6

SOFTWARE REQUIREMENT SPECIFICATION (SRS IS TO BE PREPARED USING RELEVANT MATHEMATICS DERIVED AND SOFTWARE ENGG. INDICATORS IN ANNEX A AND B)

6.1 INTRODUCTION

6.1.1 Purpose and Scope of Document

On the assumption modern machine learning techniques can lead towards for powerful tool for requirement engineering, many researchers are trying to compile requirements artifacts for different research domains. At DePaul University a collection of 15 requirement specification documents was compiled. However, this compilation has only student's projects. But unfortunately, requirements artifacts are not commonly available, due to business secrets and privacy constraints. We compiled a dataset of 39 software requirements specifications (SRS). Among these 39 SRS files, 29 are taken from industry and 10 are taken from university projects.



6.1.2 Overview of responsibilities of Developer

- Developer needs to carry out software development life cycle
- Stages definitions and debug session
- Algorithm selections and code integrations
- Hardware management in coding and justifying outputs at good rate of accuracy

- Co-ordination of front end and back end software development
- Handling mutual assistance for different coding platforms for collective results

6.2 USAGESCENARIO

System usage are applicable in,

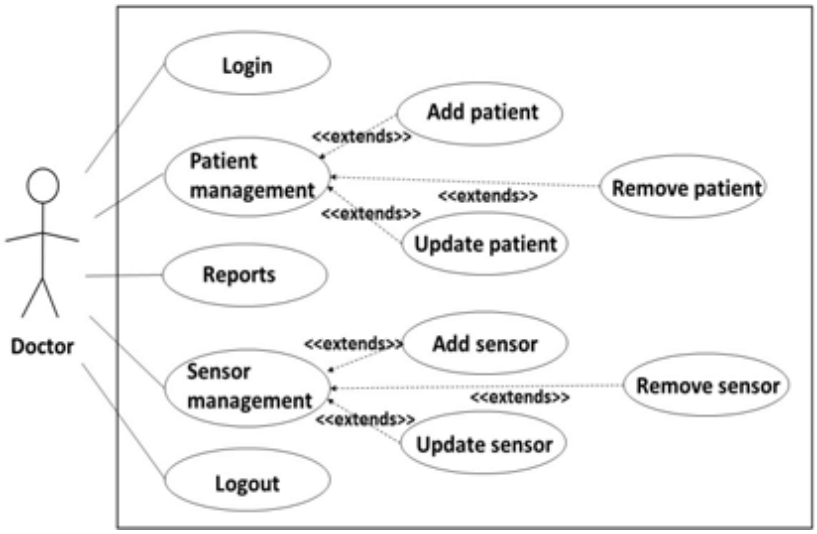
- Medical healthcare environments
- Office and corporate structure
- Personal utilization as health gadgets

6.2.1 User profiles

The profiles of all user categories are described here.(Actors and their Description)

- Teaching and Non-Teaching Staff
- Administrator
- Students

6.2.2 Use Case Diagram (Check the Diagram)



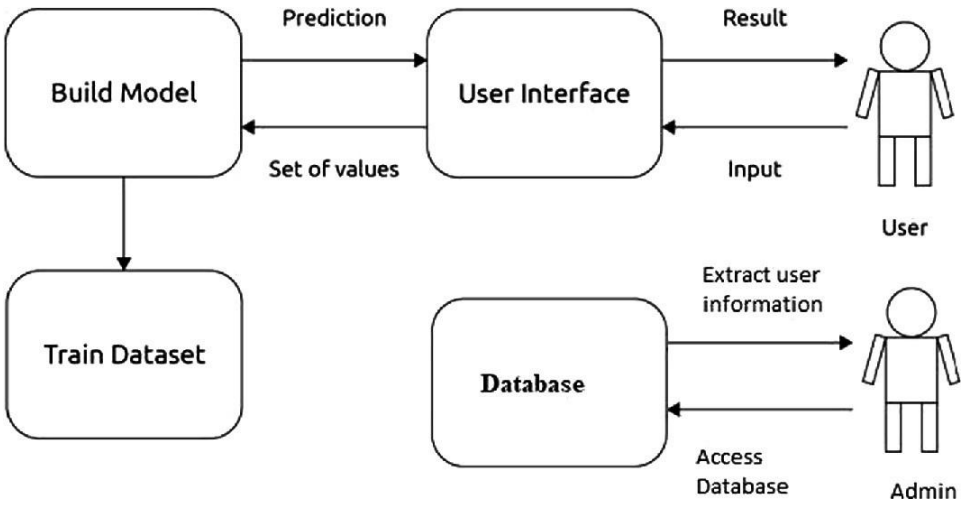


Figure 6.1: Use case diagram

6.3 DATA MODEL AND DESCRIPTION

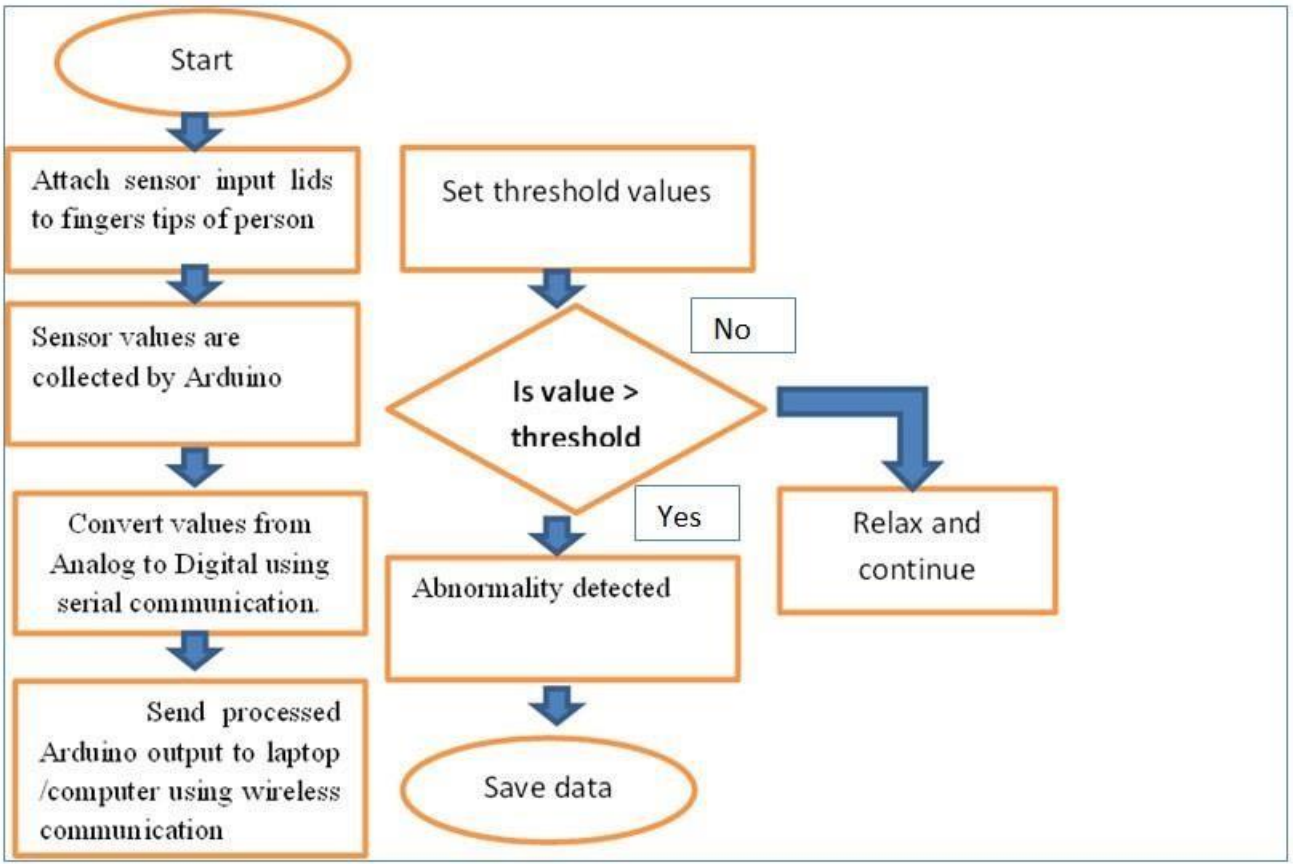
6.3.1 Data Description

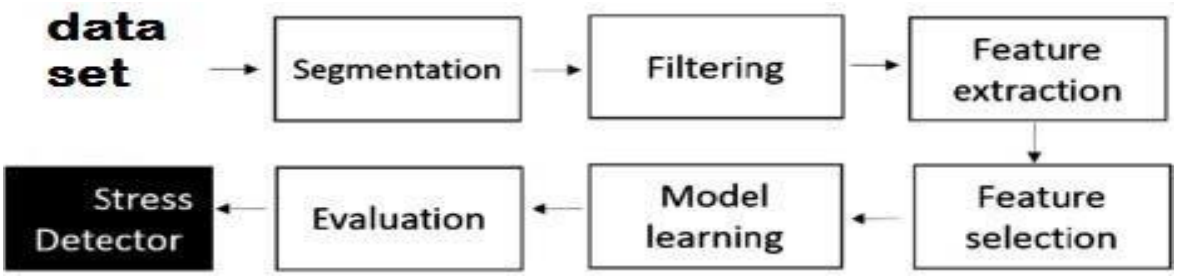
Machine learning prediction of stress or emotion is implanted using standard health data samples included in dataset. Data sets are divided into train and test sets in various ratios.

The machine learning algorithms are tested and accuracy results are compared for better algorithm selections.

Real authentic data is not manipulated much but test variation are possibly managed. Different algorithm performs in different way for different data sets.

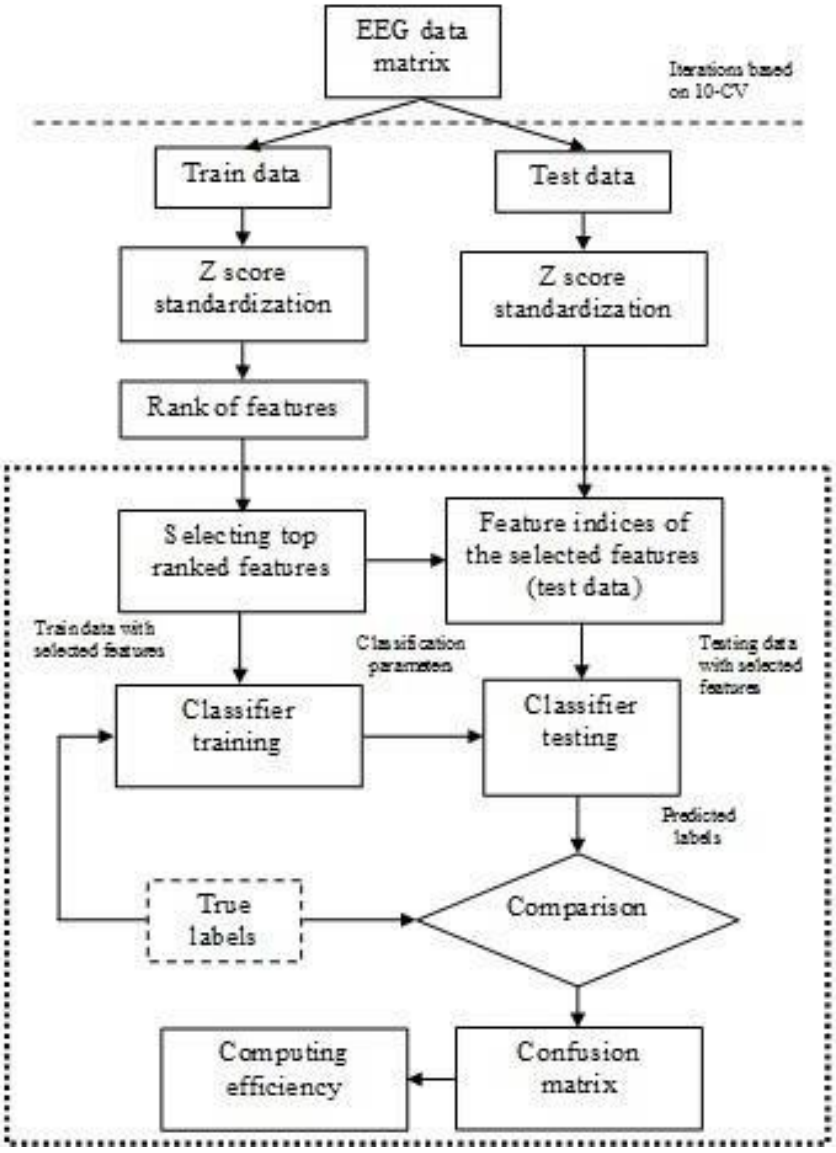
Sensor network is comparatively much stable if proper hardware gets selected. Sensor calibrations and efficiently optimized software / program can give better results. Continues read sensor values as well as live feeding of physical health parameter samples are great source utilized for project implementation and performing expected results.


Start
Attach sensor input lids to fingers tips of person
Sensor values are collected by Arduino
Convert values from Analog to Digital using serial communication.
Send processed Arduino output to laptop /computer using wireless communication
Set threshold values
Is value > threshold
No
Yes
Relax and continue
Abnormality detected
Save data


data set
Segmentation
Filtering
Feature extraction
Feature selection
Model learning
Evaluation
Stress Detector

6.4 FUNCTIONAL MODEL ANDDESCRIPTION

A description of each major software function, along with dataflow (structure danal-ysis) or class hierarchy (Analysis Class diagram with class description for object oriented system) is presented.



Data sets & Python development environment:

EEG or ECG as well as HR data along with other health and physical parameters are involved in deciding bad or good health conditions.

Training and testing sets of main data set are utilized by several ML algorithms to detect stress or emotions of person under observation or test.

Arduino, sensors sets and Application code:

Arduino computer with sensor shields as well as display unit is physical hardware for real time testing of human health conditions under different work conditions.

Continues reading of sensor data is calibrated and compare with pick and bottom values to bring out result using average of calculated results.

Arduino software

The software implemented on the Microcontroller Arduino UNO, is written in assembly C language. Figure 3 depicts a flow chart to ECG measurement. The flow starts from getting inputs from the ECG module (AD8232). The microcontroller checks whether all three inputs are given properly. If someone of the inputs is not detected well, the system send a warning; if all inputs are detected, the software send the signal thought the Bluetooth module HC-06 at the Android application to process cardiac parameters.

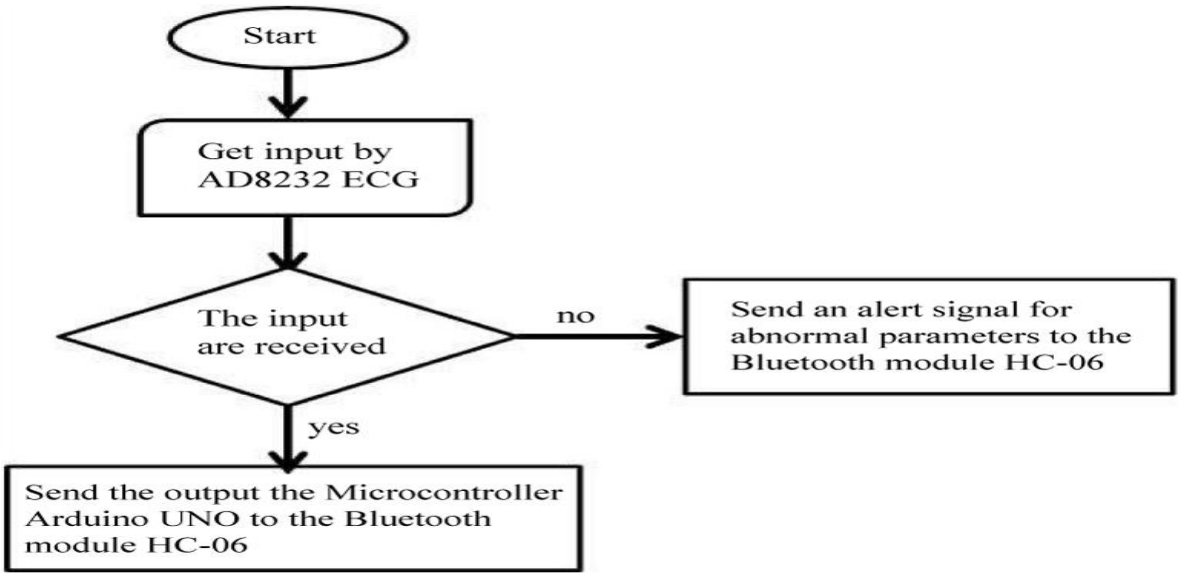
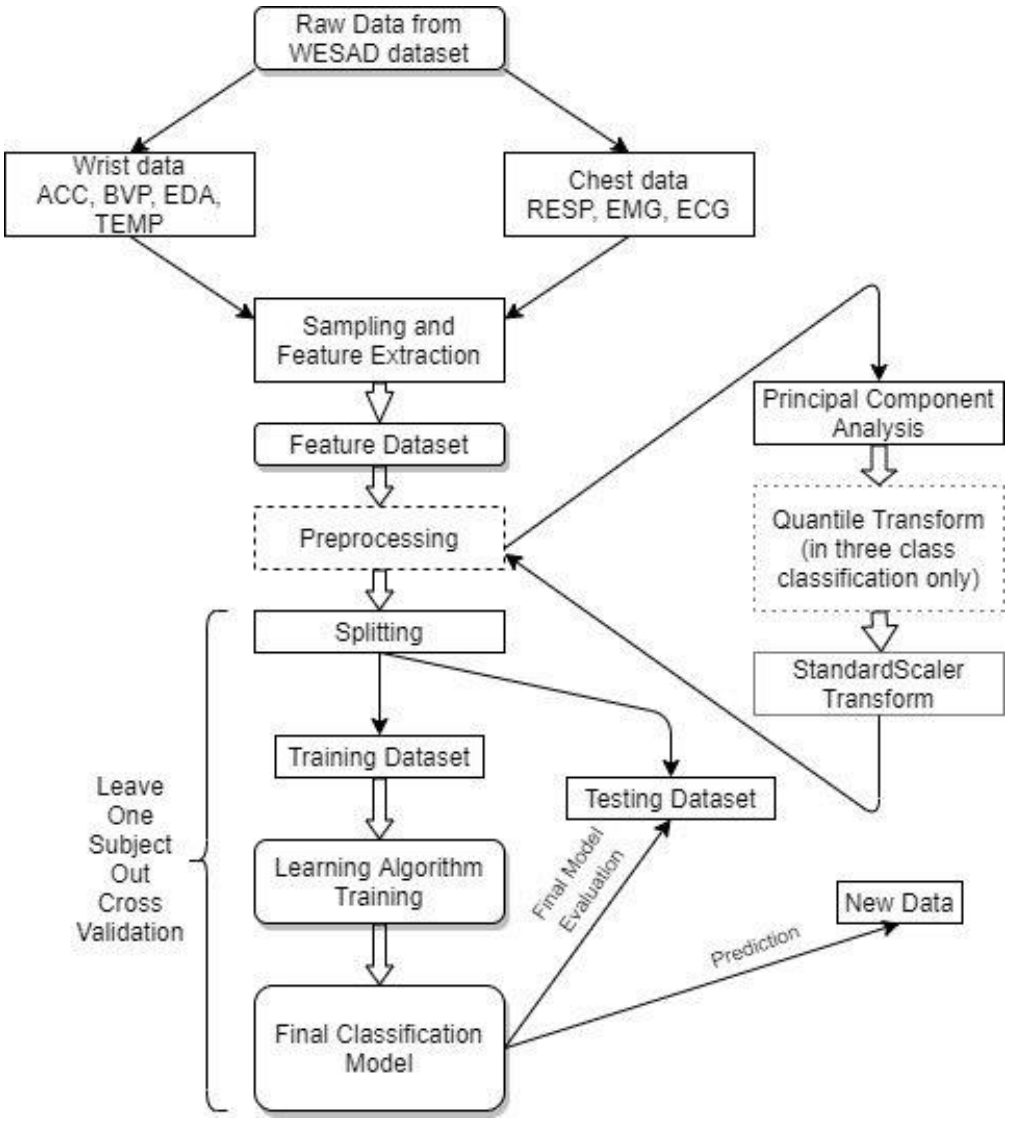
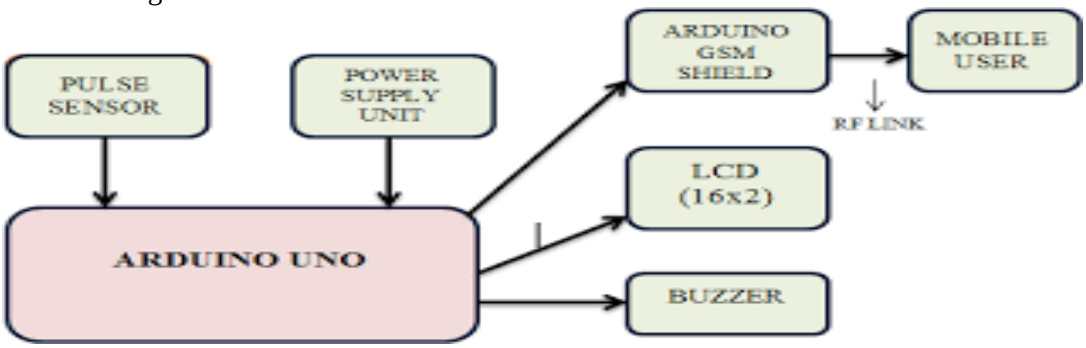


Fig: Arduino flowchart.

6.4.1 Data Flow Diagram



- Data flow Diagram



6.4.2 Non Functional Requirements:

- Interface Requirements

  Python as open source IDE and software development tool is interfaced to libraries modules for calling several computing functions for calculations and data manipulations

  This local and online interface is supporting code development sequence to execute the analytical code and prediction of results based on abstract of proposed project idea.

- Performance Requirements

  Better ML algorithms for training health parameter dataset

  Accurate hardware reading and performance under harsh and all kind of environment

  Best computing libraries and code sequencing for arduino based application program

6.4.3 State Diagram:

- State Transition Diagram

Machine learning algorithms aim to optimize the performance of a certain task by using examples and/or past experience.67 Generally speaking, machine learning can be divided into three main categories, namely, supervised learning, unsupervised learning, and reinforcement learning.

Supervised machine learning is based on the same principles as a standard fitting procedure:

it tries to find the unknown function that connects known inputs to unknown outputs. This desired result for unknown domains is estimated based on the extrapolation of patterns found in the labeled training data. Unsupervised learning is concerned with finding patterns in unlabeled data, as, e.g., in the clustering of samples. Finally, reinforcement learning treats the problem of finding optimal or sufficiently good actions for a situation in order to maximize a reward.68 In other words, it learns from interactions

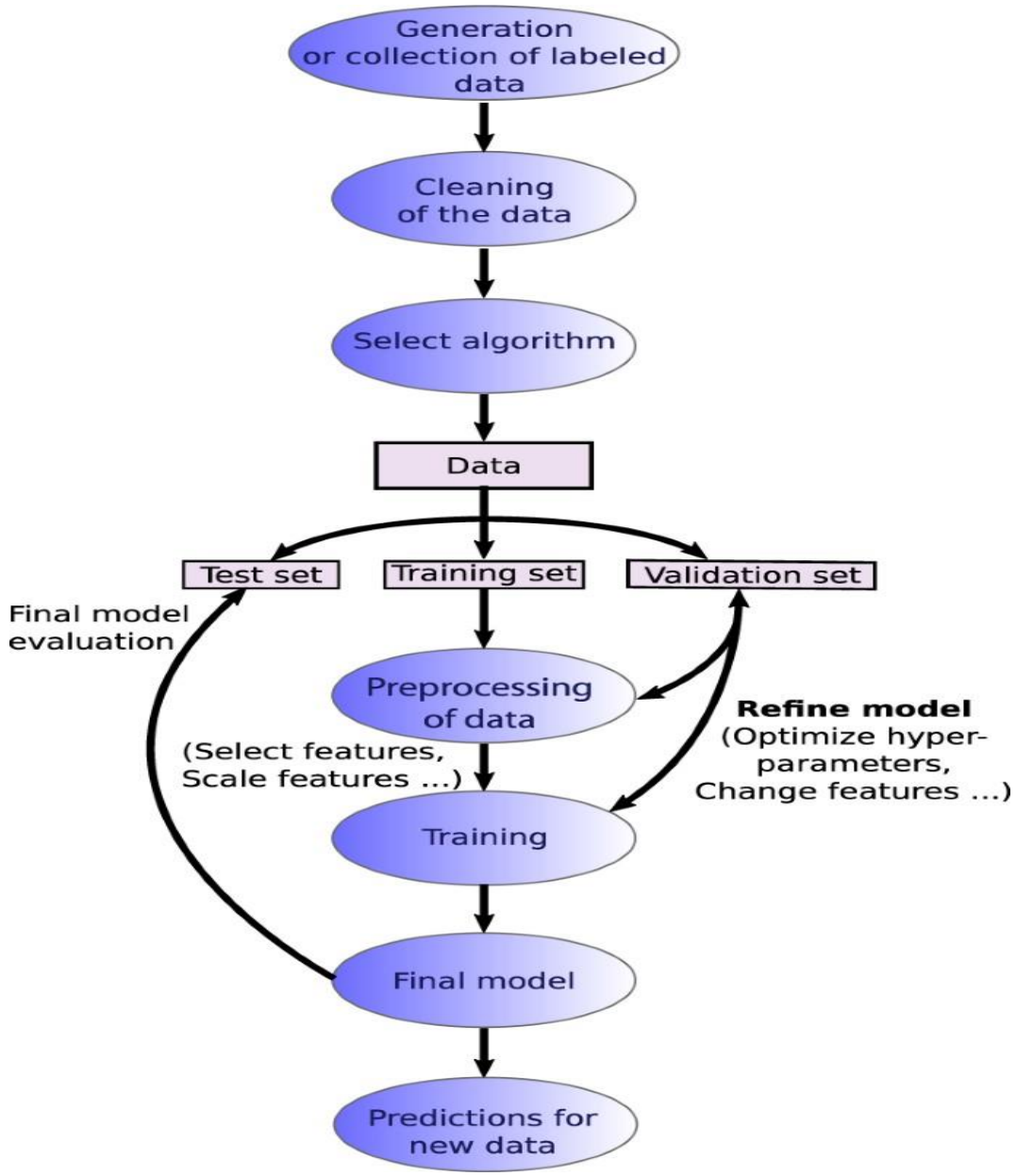


Figure 6.3: State transition diagram

6.4.4 Design Constraints

Design constraints are conditions that need to happen for a project to be successful. Design constraints help narrow choices when creating a project. In our example, at first any food in the entire world might be on your menu, but then you remember your budget and the choices get smaller.

CHAPTER 7

DETAILED DESIGN DOCUMENT USING APPENDIX A AND B

7.1 INTRODUCTION

First part of system is utilized to detect stress or detect emotion based on face or ECG or HR data samples from user. Standard dataset is stored in system for learning the model for stress detection. Second part of system is implemented using embedded microcontroller and set of sensors and display unit for health condition detection either normal or odd.

7.2 ARCHITECTURALDESIGN

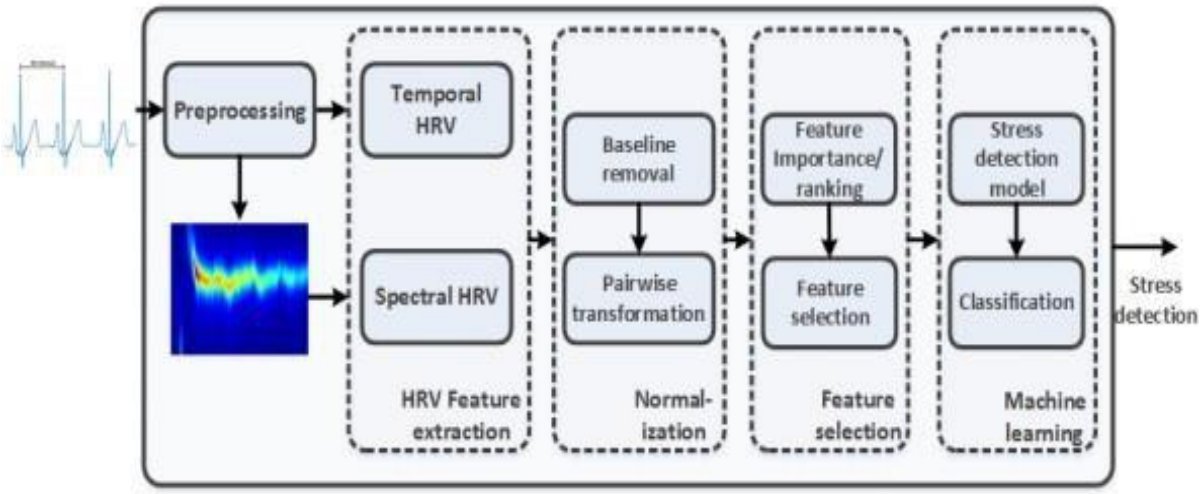


Figure 7.1: Architecture diagram of system 1

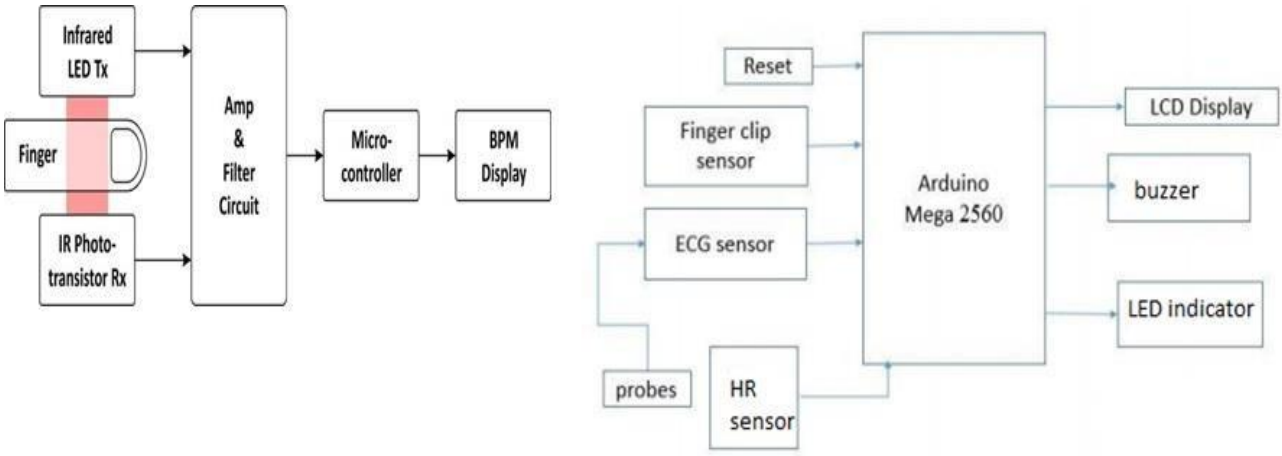


Figure 7.2: Architecture diagram of system 2

7.3 Data design

A description of all data structures including internal, global, and database design (tables), file formats.

7.3.1 Internal software data structure

The **internal data structure** assigns unique IDs to each wall and maintains the accuracy of buildings' geometric information with the help of vertices, edges, and polygons. This step is essential to remove redundant information and provide spatio-semantic coherent **data structure** for energy simulation

7.3.2 Global data structure

Data structured that are available to major portions of the architecture are described.

7.3.2 Data base description

The data base will be used to store data for future prediction.

7.4 Component Design

A Component Design is a **design** specification for one of these Adaptable Components. Each component must be designed to satisfy relevant aspects of the Product Requirements and all design structures of the Product Architecture

7.4.1 Class Diagram

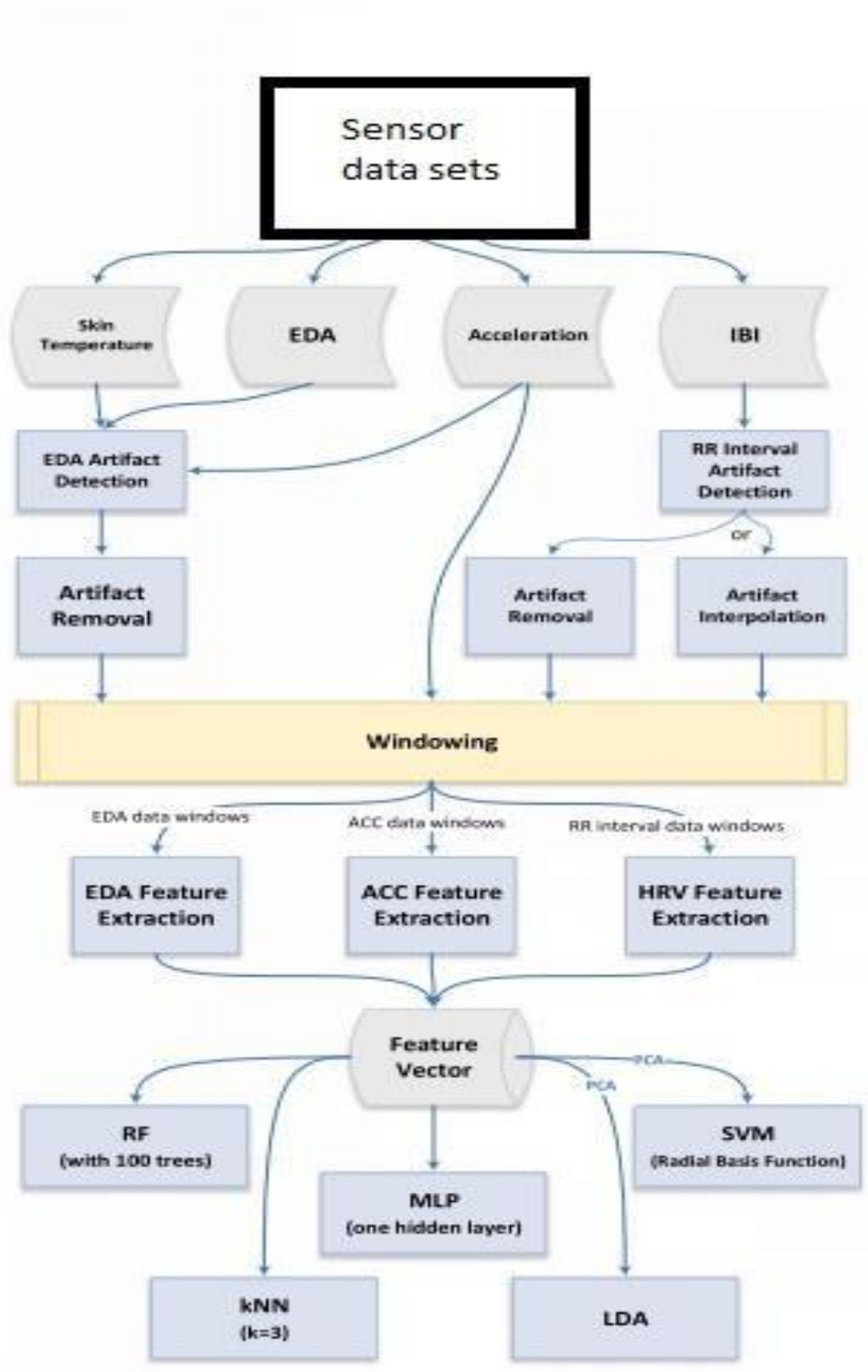


Fig. 7.3 class diagram

CHAPTER 8

SUMMARY AND CONCLUSION

Summary and conclusion:

As of now, even with our technological advancements, there is no low-cost reliable solution available for detecting stress. Although there are many mobile applications available regarding e-Health, there is no application to measure stress accurately. Our work uses previously identified stress markers to determine the stress level with low-cost hardware and comparatively higher accuracy. Since this approach involves ECG, we analyze the exact condition of the user with the help of their heart signals.

As well as webcam images are processed using python to send additional support to take health situation information. This is the reason behind improved accuracy and, in the near future, there will be unobtrusive solutions to detect stress levels with less hardware. We have reduced the hardware modules required by coding effective programs to analyze the stress level and by hitting a tradeoff with higher accuracy at the expense of sophisticated devices.

The current study proposed a method based on ultra-short- term HRV analysis to automatically identify stressed. The presented classifier achieved satisfactory results through validation procedure, enabling to detect stress with a sensitivity rate of 78% and a specificity rate of 80%. However, further research on a large sample size will help to further elucidate the findings of the developed classifier.

The progress in bio medical engineering, science and technology paved way for new inventions and technologies. As we are moving towards miniaturization, handy electronic components are in need. New products and new technology are being invented. ARDUINO was found to be more compact, user friendly and less complex, which could readily be used in order to perform several tedious and repetitive tasks. Simulation is performed using Proteus software by placing appropriate sensors like temperature and heart beat rate for sensing the health condition and the results are analyzed under normal conditions and abnormality conditions.

CHAPTER 9

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CHAPTER 10

RESULTS

Results:- (Software)

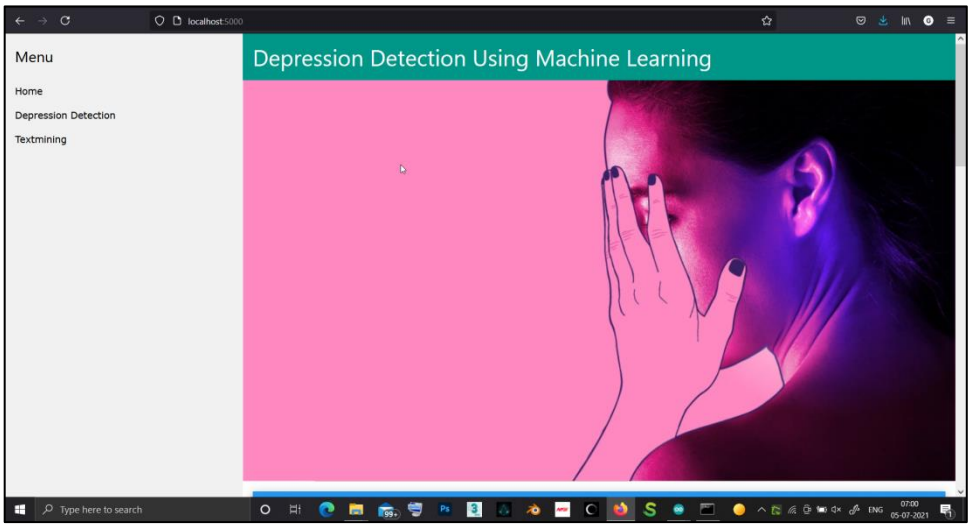


Fig: Home-Page

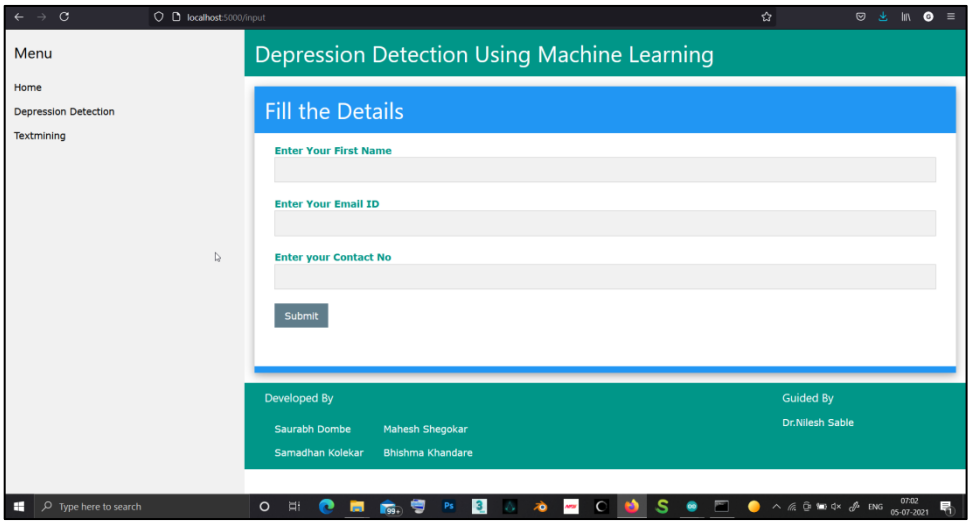


Fig: Filling the details.

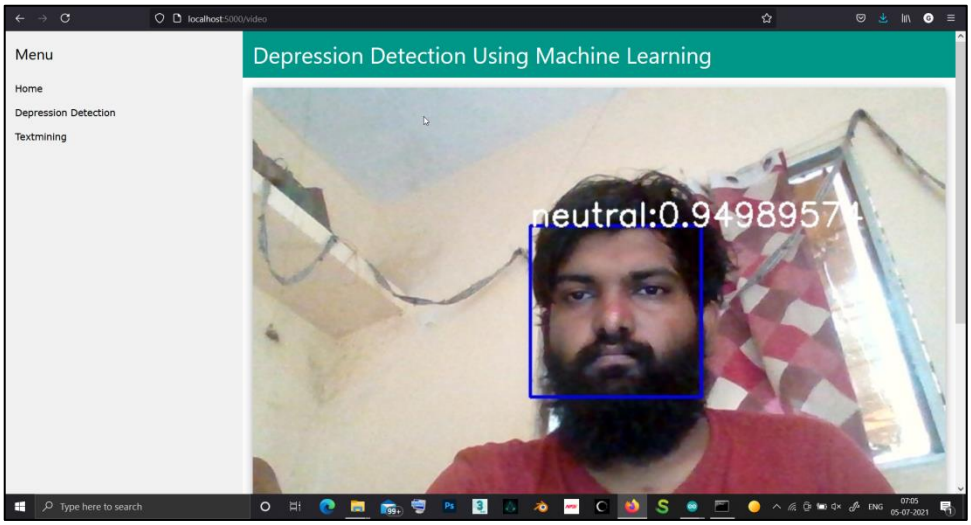


Fig: Face-expression detection.

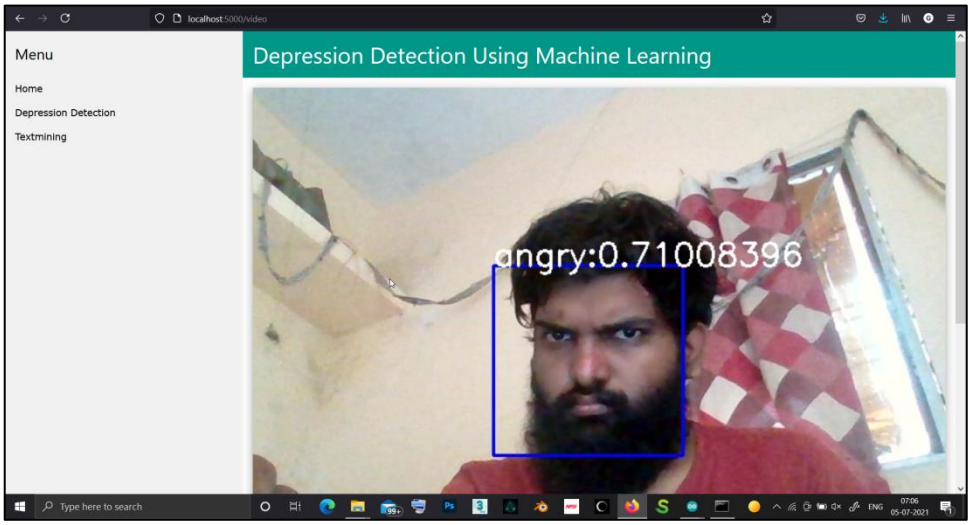


Fig: Angry-face detection.

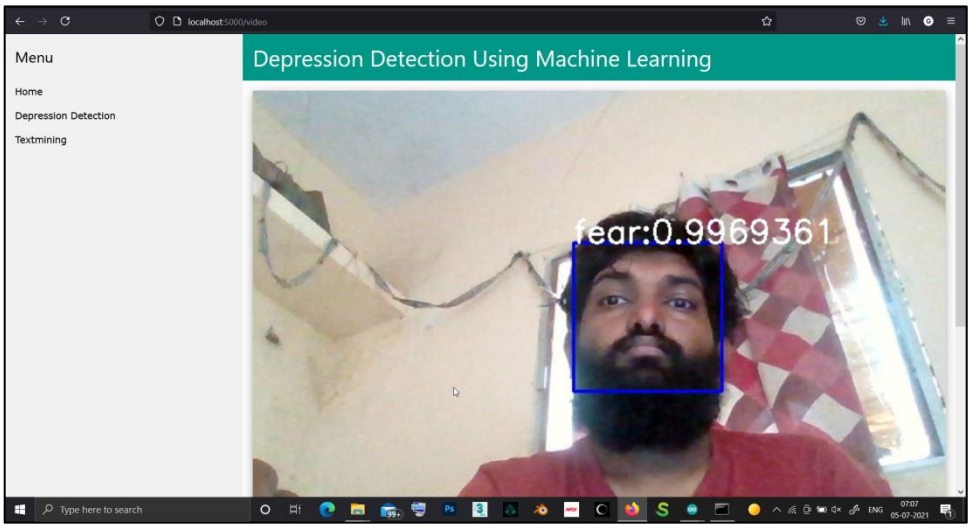


Fig: Fear-face detection.

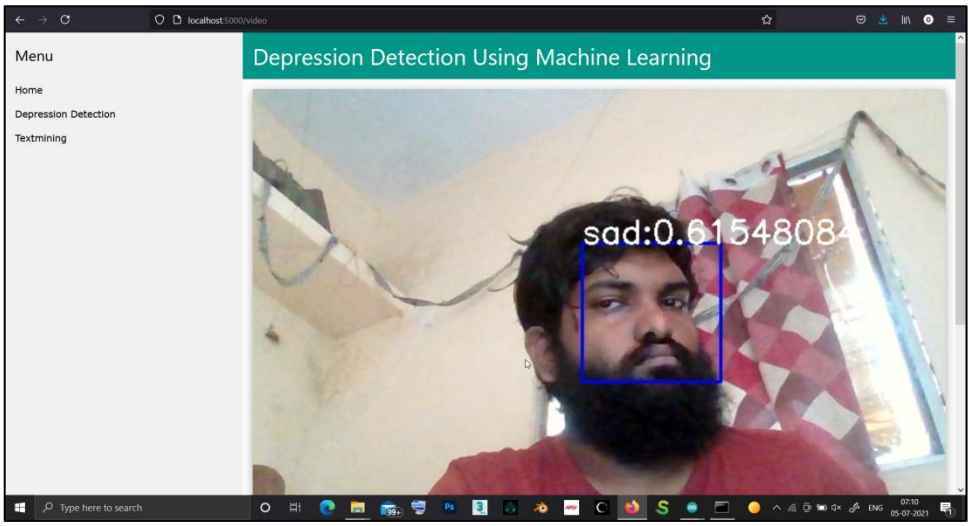
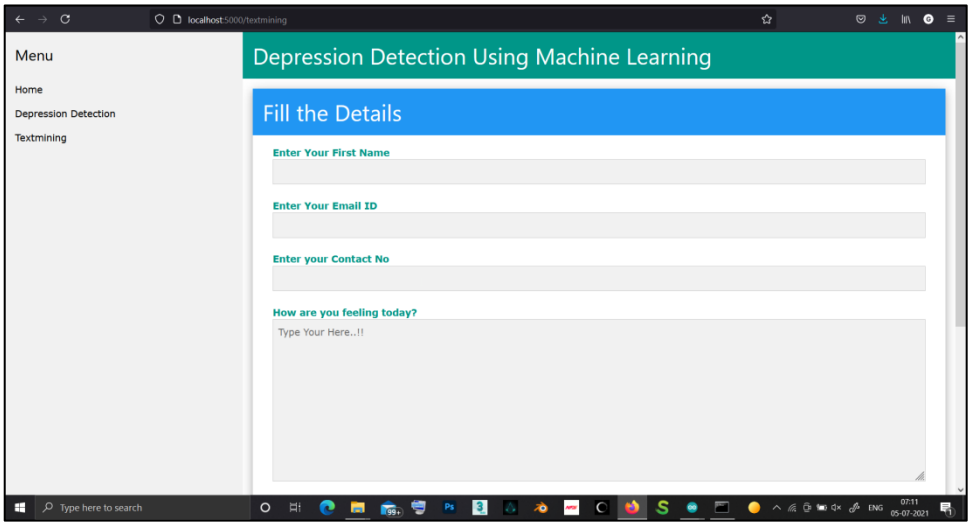


Fig: Sad-face detection.



Fig; Text-mining

Hardware:-