**A PROJECT REPORT**

**on**

# "Tractiv - IOT based social safety app "

**Submitted to**

## KIIT Deemed to be University

**In Partial Fulfilment of the Requirement for the Award of**

**BACHELOR'S DEGREE IN**
**INFORMATION TECHNOLOGY**

**BY**


| | |
|---|---|
| **SHAILESH DAS** | **1705819** |
| **SHRISHTI** | **1705893** |
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**UNDER THE GUIDANCE OF**
**PROF. RAJDEEP CHATTERJEE**

**SCHOOL OF COMPUTER ENGINEERING**
**KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY**
**BHUBANESWAR, ODISHA - 751024**



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# KIIT Deemed to be University

School of Computer Engineering
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# CERTIFICATE

This is certify that the project entitled

"**Tractiv - IOT based social safety app**"

submitted by

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is a record of bonafide work carried out by them, in the partial fulfilment of the requirement for the award of Degree of Bachelor of Engineering (Computer Science & Engineering OR Information Technology) at KIIT Deemed to be university, Bhubaneswar. This work is done during year 2019-2020, under our guidance.

Date: 27/05/2020

(Prof. RAJDEEP CHATTERJEE)
Project Guide

# Acknowledgements

We are profoundly grateful to Prof. Rajdeep Chatterjee for his expert guidance and continuous encouragement throughout to see that this project rights its target since its commencement to its completion. .....

SHAILESH DAS
SHRISHTI
ANUSHMITA DAS
ROHIT HALDER

# ABSTRACT

In the project, a light weight computational model integrated with an android app and a smart watch has been developed for effective autonomous monitoring of the citizens while they are walking around in the society/streets, travelling from one place to another leaving behind their parents at home and soon. Unsocial activities or accidents come about without any prior notices. No organisation can effictively monitor the activities of 130 crore population. So the mischief gets unnoticed. Our automated system not only detects the victim, it also traces the his/her current position for the upcoming 30 minutes notifying his/her peers and asking them for help. Hence we have relied on a peer to peer help system rather than giving the responsibility to a centralised security agency.
Our project aims at realtime security surveillance sytem using IOT. Our proposed system uses gesture detection algorithm using the readings from the default acceleratometer sensor embedded with the smart phones. Apart from that our custom built smart watch is also embedded with an acceleratometer. Unlike other security systems which uses manual triggering system or cctv based surviellance system, which are confined to a local area, does not serve automation, have a poor stability and consumes a lot of resource in terms of storage, our system significantly reduces the storage costs and investment. **The accuracy of our ML model used for classification of gesture is 96.51%**.

**Keywords: IOT, security system, machine learning, peer to peer, android, smart watch**.

# Contents

# List of Figures

# Chapter 1

# Introduction

## 1.1 Overview

Internet of Things have brought about a rapid shift in dimension with respect to communication. In the era of IOT, the machines/ sensors communicate to each other. IOT when merged with Data Science, can be used to automate a large variety of devices. Using the benefits of this system, we have automated the monitoring of human actions, which will be helpful in case of social and medical emergencies.

## 1.2 Purpose

### 1.2.1 Our Goals and Objectives

Our objective is to create a security enhancement system (using a security band and an associated mobile app) with 24x7 availability. We developed this software for the intent to get quick and faster actions to avoid any crimes scenes or to get quick medical help during an emergency situation like car accidents. The applications sents alert messages to peers using the application by sending alert notifications containing the gps location of the victims. This is an automated process invoked in the application.

### 1.2.2 Drawbacks of Previous Systems

The major issues related to the existing applications are lack

of proper database management. Apart from that, the most important feature lacking in theseapplications is automation. Victims to social injustice doesn't have ample amount of time to open up the app and seek for help or inform their family members about their location.

## 1.3 About the Project

Machine Learning or automation is used in the scenerios where the data to be processed is uncertain and huge and its not practicially feasible for human to carry out the job or any hard coded algorithms to cover up all the boundaries. These types of system prefers soft computation.
The working of the application/system lies in the hands of the victims. And the peers whom the notifications are sent to.
The major victims for our application/system include:
1. The women who are subjected to social injustice
2. The people who have met a sudden accident
3. The old parents who have been left at homw while their son/daughter going for work.

The peers can be anyone who are present in that city and has the application installed. The brief description of our project has been shown in the figure 1.1.

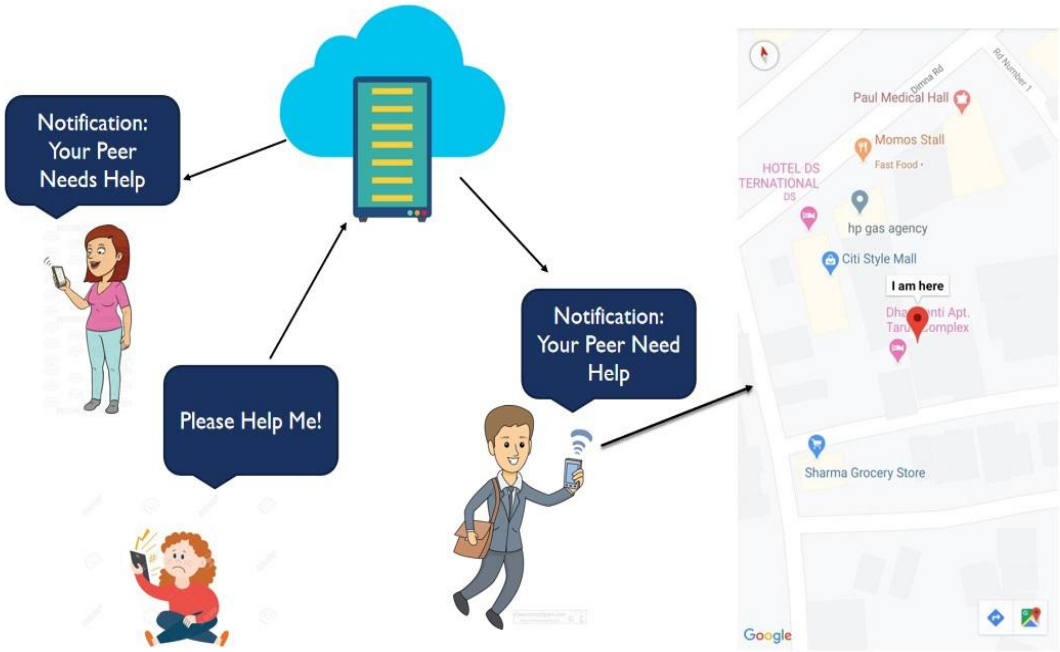



**Figure 1.1: Overview of our Propsed System**

## 1.4 Roadmap

In Chapter 1 we have the Introduction, the chapter is followed by a breief section on Literature survey. In the following sections we have discussed about the software requirement specification and requirement analysis. It is followed by a chapter on system designs where use case, sequence and class diagrams corresponding to out projecct are shown. Then we have a chapter on project planning which deals with the basics behind the concept of our automation. It is further followed by a chapter on implementation.of our project, where it is demostrated how the modules are implemented in our project. The following chapters deals with the test cases and the results of our diffenent module and associated screen shots juastifying our work. Then we finally conclude with the chapter conclusion and future works.

# Chapter 2

# Literature Survey

The era of IOT began when machines began to communicate between each other, transfer data between each other, without human intervention. It increased the degree of automation increasing the coupling between two different modules [1]. The aplication of IOT was far sighted and covered domains like smart home appliances, elder care, medical and health care, transportation, V2X communication, industrial and agricultural applications, environmental monitoring and even military applications [2].

People used to track antisocial antivities using cctv surveillance cameras [3], my means of degree of rotation of arm [4], or presence of blood or the sentiment analysis of speech. These approaches were mainly used to detect crime suspects rather than preventing crimes. Later in the century, people began to study the motive began crimes, researchers like G Schalk, DJ McFarland, T Hinterberger began to associate emmission of alpha, beta and gamma radiations from the brain which could be beneficial to detect the motives which could end up in crimes [5,6,7]. However the approach involed costly setup for detection of such crimes which did not seem to be practicially feasible.

It was around the year 2013 when Z Ying-cong, Y Jing introduced the applications of IOT in social security aspect, covering fire disaster surveillane and alarming [8].

In 2014, W Zhou, S Piramuthu, proposed fitness band embedded with IOT sensors to track down people in a society[9].

Between the year 2014 to 2017 a number of reseachers beganto use IOT as means to detect theft in agricultural fields and illegal electricity consumption [10,11,12].

In this project we have merged the tracking modules (gps sensors) along with the acceleratometer modules (used to measure the angular acceleration) to detect the gestures performed by the individuals and in case of any gesture mapped to emergency situtations must be provided with an immediate solution.

# Chapter 3

# Software Requirements Specification

## 3.1 PURPOSE

Our objective is to create a security enhancement system (using a security band and an associated mobile app) with 24x7 availability. We developed this software for the intent to get quick and faster actions to avoid any crimes scenes or to get quick medical help during an emergency situation like car accidents.

The applications sents alert messages to peers using the application by sending alert notifications containing the gps location of the victims. This is an automated process invoked in the application.

The major issues related to the existing applications are lack of proper database
management. Apart from that, the most important feature lacking in these
applications is automation. Victims to social injustice doesn't have ample amount of time to open up the app and seek for help or inform their family members about their location. Thus in our application the accelerometer and gyroscope sensors of the mobile continuously measures the angular velocity and acceleration.

So a particular gesture made using the cell phone can automatically trigger the help centers and the local guardians for help.

## 3.2 INTENDED AUDIENCE AND READING SUGGESTIONS

This document is aimed at developers, project managers, testers, band and app users. This document will be helpful to the comman man for his/her understanding of the system along with its working.

## 3.3 PRODUCT SCOPE

The working of the application lies in the hands of victims and the peers or the neighbours the alert notification is sent to.

✧ **Victims-**

This category includes the victims of any heinous crimes or victims of any accidents like sudden fall or car accidents etc.

- ✓ If the victim is using app rather than band then he/she must be registered.
- ✓ The users must have their location services on.
- ✓ Valid user information should be provided by the users to avoid any misuse of the application.
- ✓ Female users who needs help can perform a gesture or may also click the SOS button in the app to access help from near by peers.

- ✓ Databases containing contacts of friends or family can be maintained to access help during any accident.

✧ **Peers or Neighbours-**

This category includes nearby app users or peers or neighbours who needs to take immediate action. If any victim is in need of help then this category is notified with GPS location of the victim for immediate help. Peers can get the get the details of the citizens who are in trouble on a map.

# Chapter 4

# Requirement Analysis

## 4.1 FUNCTIONAL REQUIREMENTS

- ✓ To provide a security system to women from any sort of despicable or heinous crimes .
- ✓ It sends SMS with GPS location to selected contacts in case of any emergency when the victim sends a signal by doing a particular gesture.
- ✓ In case someone falls due to emergency (like aged parents faint and fall in the house when no one is there in the house) then the neighbours will get a notification from the application so as to help to provide a medical help.
- ✓ Also in case of accidents this app works to inform the contacts by sending the GPS location through SMS.
- ✓ The application works in mobile app as well as in a band and connects to the database of contacts when any uneven incident occurs.

## 4.2 NON FUNCTIONAL REQUIREMENTS

### 4.2.1 SAFETY REQUIREMENTS

- ✓ Database is a great concern in most of the safety apps so its should be managed and backed up frequently to avoid dataloss.
- ✓ Data should be normalized to avoid redundant informations.

- ✓ Proper sensors should be used so as to avoid misleading gesture detections.

### 4.2.2 SECURITY REQUIREMENTS

- ✓ User information should be secured in the database, i.e, access constraints should be assinged to user information that they provide.

### 4.2.3 SOFTWARE QUALITY ATTRIBUTES

- ✓ CORRECTNESS- Faulty validation of the data can lead to incorrect data storage of the users in the database. So correctness is an important concern for the software.
- ✓ MAINTAINABILITY- The watch should continuously keep a check on the data provided by the sensors about the gestures of the users.

## 4.3 EXTERNAL INTERFACE REQUIREMENTS

### 4.3.1 HARWARE BASED

- ✓ **Accelerometer Sensor-** Measures the linear accleration of an object along different axes.
- ✓ **Gyroscope Sensor-** It measures the rate of rotation of the object around different axes or is used to measure the angular position of the object

### 4.3.2 SOFTWARE BASED

- ✓ **Android Studio:**

It is used here to design the whole safety application that is visible to the user. It provided the framework to test if the user requirements are fulfilled or not. Because of it's built in support of the cloud platform we are able to use cloud maps for locating the victims

- ✓ **Star UML:**

One of the important phase of software development is analysing and designing phase. Star UML helped to make UML diagrams for better understanding of how the software will work by finding the necessary components of the software.

- ✓ **Firebase:**

Firebase on linking with the android platform helped to work with real-time databases with proper user authentication so that we can track the victim in need. .

## 4.4 RISKS INVOLVED

### 4.4.1 Operational Risks

- ✓ No of users for the application.

- ✓ The instructions of using the application must be clear else unecessary alert notifications may be generated.
- ✓ Location services should be kept on.

### 4.4.2 Technical Risks

- ✓ Untrusted inputs or unauthorized inputs can lead to malfunctioning and unecessary disturbances to peers.
- ✓ Since every human being is unique, hence the actions committed by them is also. Hence the training of model needs to be robust for proper functionality.
- ✓ Change of products according to the requirements of the products.

### 4.4.3 Schedule Risks

- ✓ Since the system is automated so we might have a lot other cases of false positive issues, leading to the harassment of the helpline centres, and security hubs.
- ✓ A simple fall of phone or band may lead to wrong estimation.

# Chapter 5

# System Design

## 5.1 System Overview

Our purpose of this project is to create a security enhancement system (using a mobile app and an associated motion detection watch) with 24x7 availability. We developed this software Application for the intent to get quick and faster actions to avoid any crimes scenes or to get quick medical help during an emergency situation like car accidents.
The applications sends alert messages to peers using the application by sending alert notifications containing the GPS location of the victims. This is an automated process invoked in the application. Our App is compatible with both IOS and Android Operating Systems. We have Enhanced and Additional User interfaces (UI) which provide users with much simpler use and understanding of the app. All the intricate tasks and majority of the Computing Tasks are handled by our REST API, resulting in better functioning of the app locally in User's Smartphone.

## 5.2 Design Constraints

- The Application will be available only in English. The user must register to issue SOS.
- Any Peer, who have the app installed can reach out for helping others. Unique Mobile Number and Mail-ID is mandatory to create a profile.

- Users who have the knowledge of accessing internet facilities can only utilize the offered services.

## 5.3 System Architecture

### Use Case Diagram

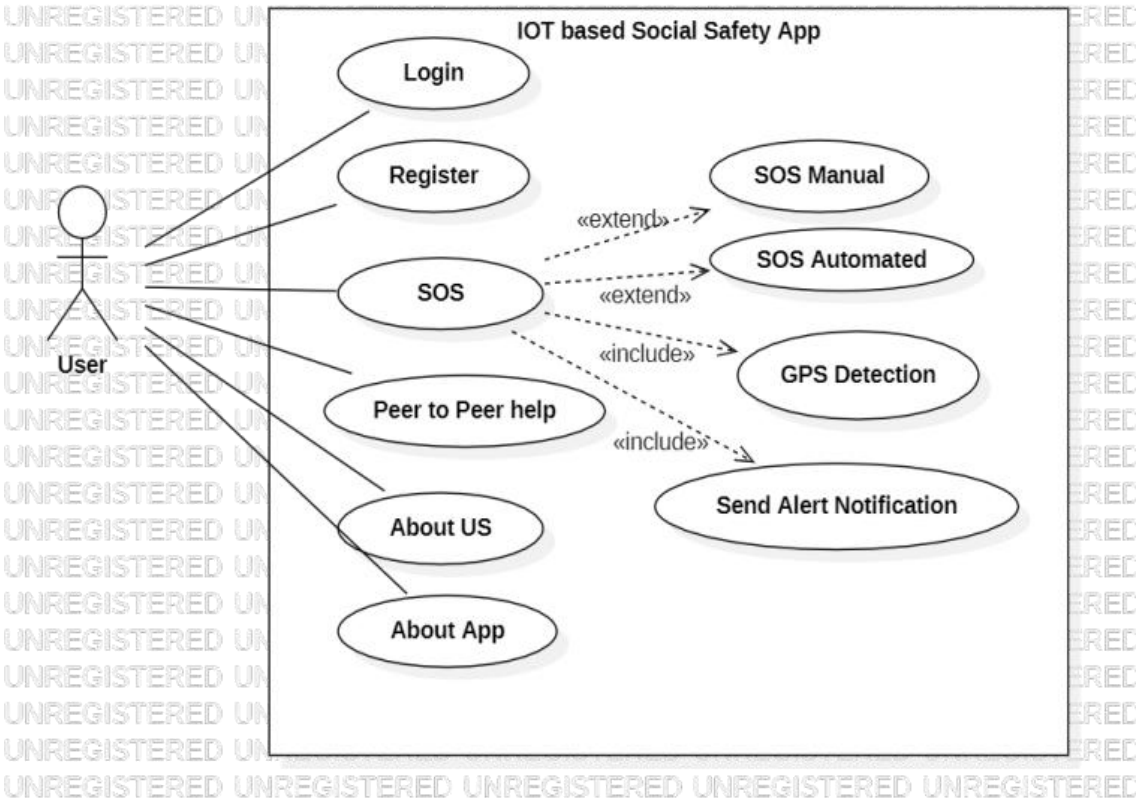



**Figure 5.1: Use Case Diagram**

A use case Diagram is a graphic depiction of the interactions among the elements of a system[13].

## Class Diagram

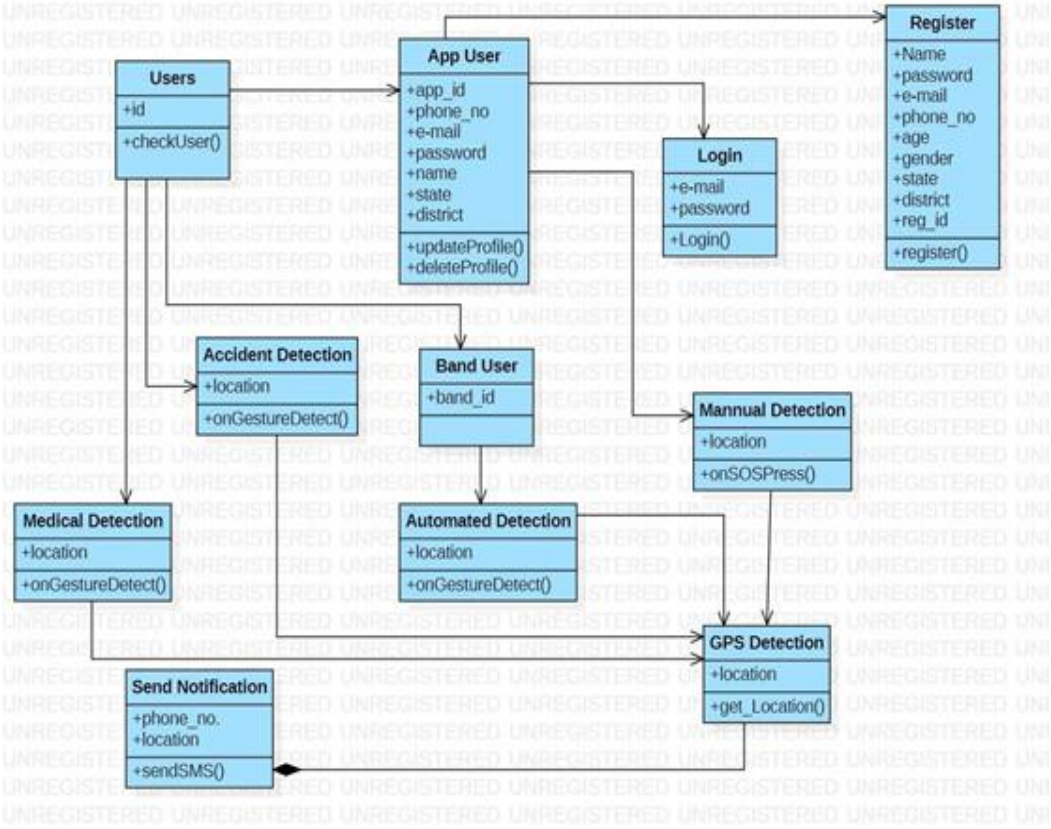



**Figure 5.2: Class Diagram**

A class diagram is an illustration of the relationships and source code dependencies among classes in the unified modelling language (UML) [14].

## Activity Diagram

Activity diagrams are useful for business modelling where they are used for detailing the processes involved in business activities[15].

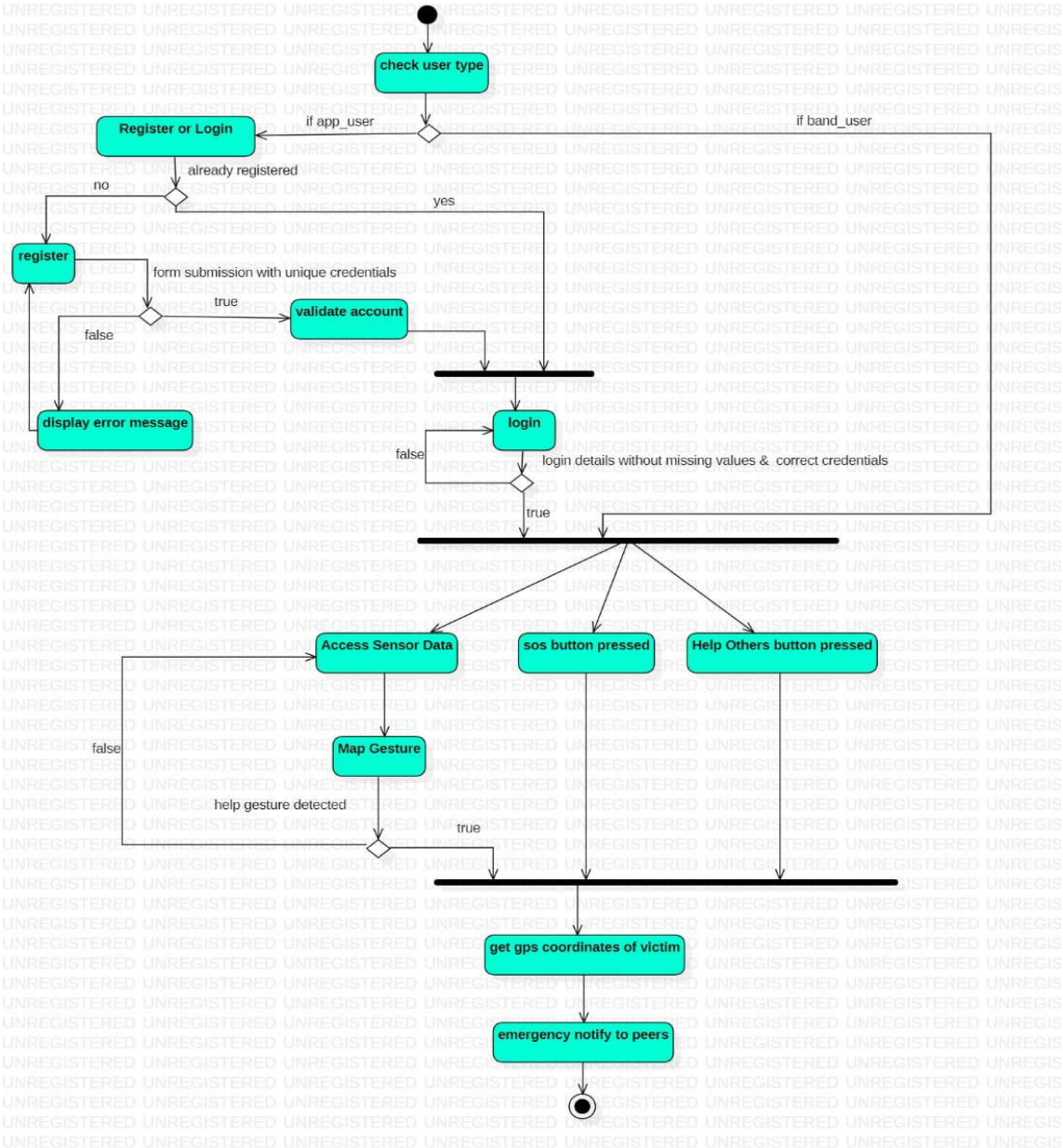



**Figure 5.3: Activity Diagram**

## Sequence Diagram

It depicts the objects and classes involved in the scenario and the sequence of messages exchanged. Between the objects needed to carry out the Functionality of the scenario[16].

### SEQUENCE DIAGRAM FOR "SIGN UP" USE CASE

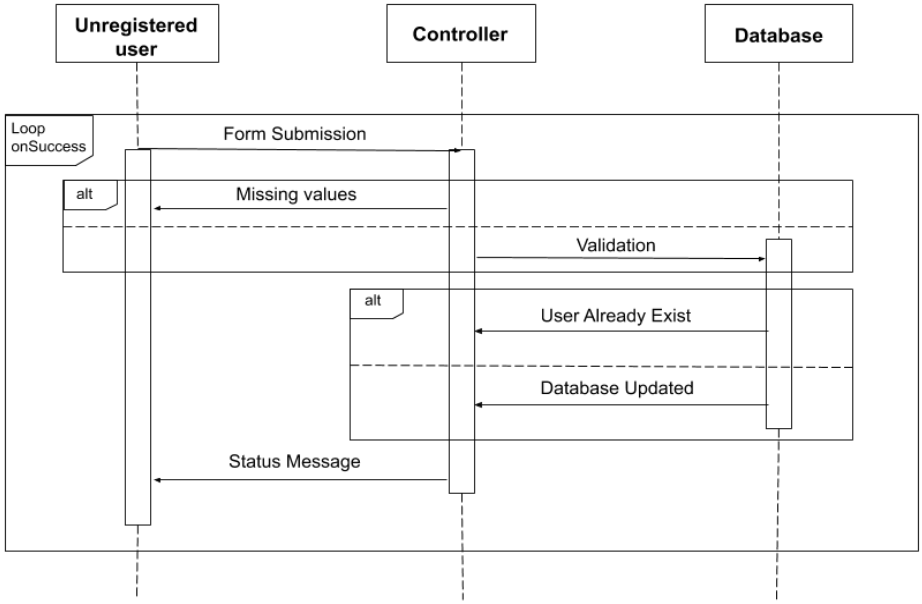



**Figure 5.4: Sign up sequence diagram**

# SEQUENCE DIAGRAM FOR "LOG IN" USE CASE

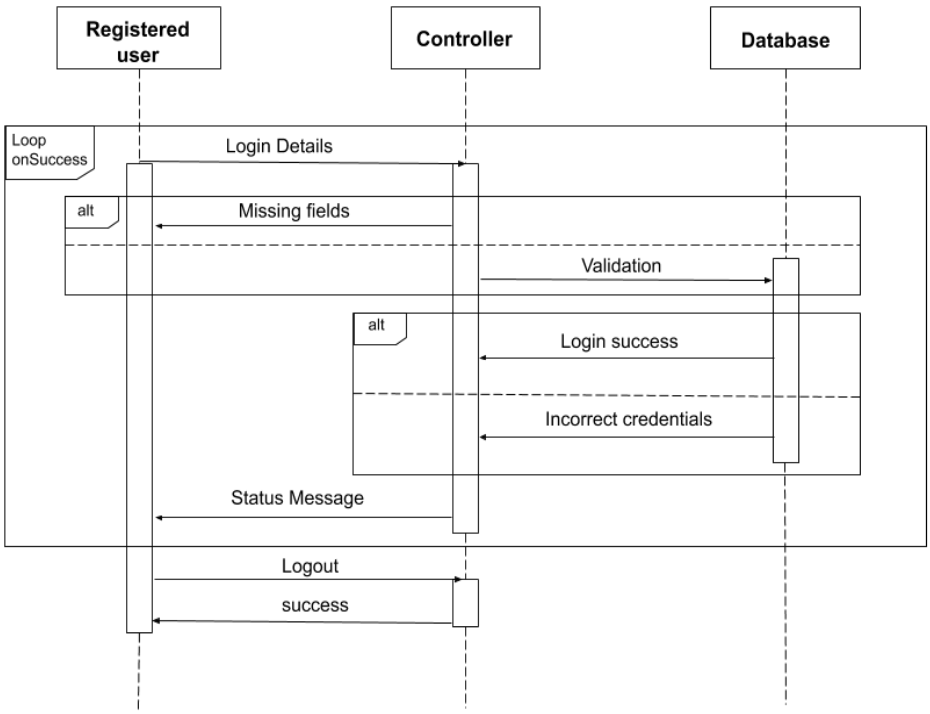



**Figure 5.5: Log in sequence diagram**

# SEQUENCE DIAGRAM FOR "SOS" USE CASE SOS MANUAL

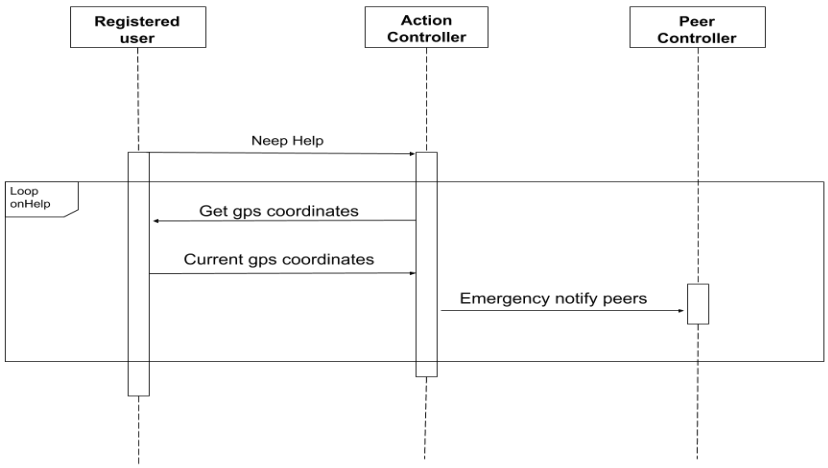



**Figure 5.6: SOS sequence diagram (manual)**

# SOS AUTOMATED

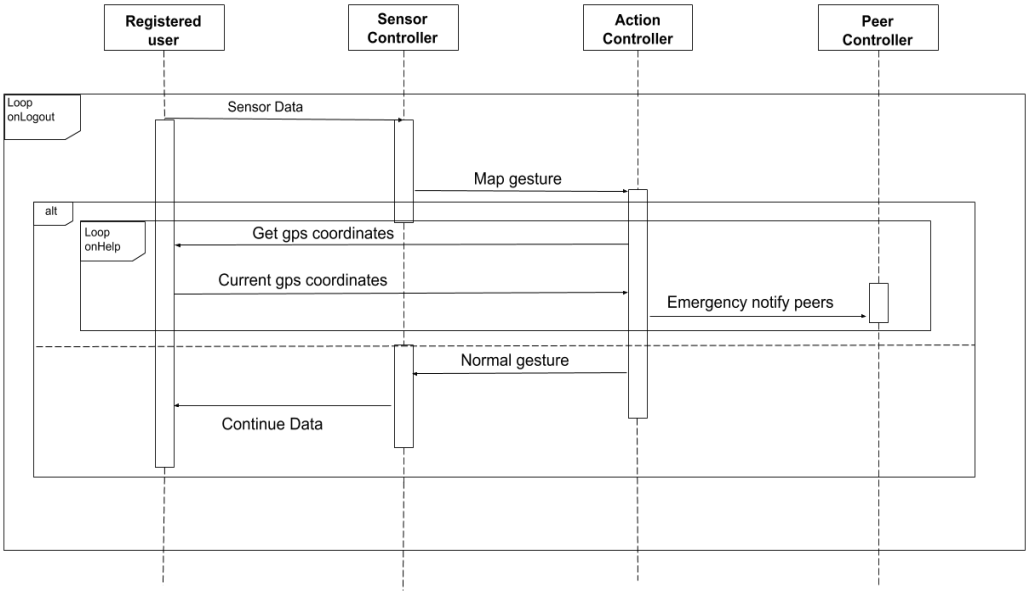



**Figure 5.7: SOS sequence diagram (automated)**

# SEQUENCE DIAGRAM FOR "HELP OTHERS" USE CASE

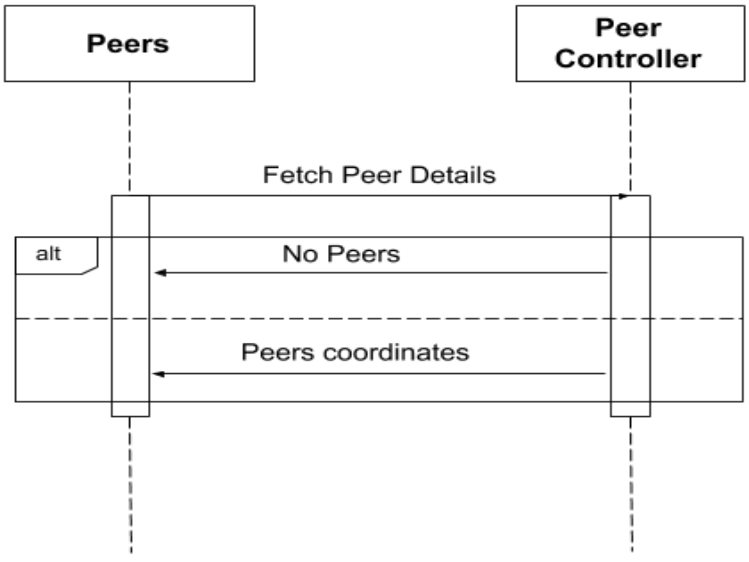



**Figure 5.8: Help othetrs sequence diagram (automated)**

## 5.4 Database Design

Structured data stored in the database will be searchable and sortable in order to meet both automated and manual reporting requirements. As such, the database field names are consistent with all fields built into the User Data Entry Module, Automated Reporting Module, and Manual Reporting Module.
The fields included in the Database are as Follows:

- First Name
- Last Name
- Email address
- Unique API key ( Every Smartphone has a unique key when our app is installed )

Our Application Database is hosted in Firebase platform. We chose Firebase for scaling and stability of the Platform and zero outage time.

# Chapter 6

# Project Planning

## 6.1 Project Architechture

The basic project architechture is shown in the figure 6.1.
The major components of our achitechture includes

- ML model
- User Interface
- Cloud storage and crossplatform integration

We will be briefly discussing about the model architechture in this section.

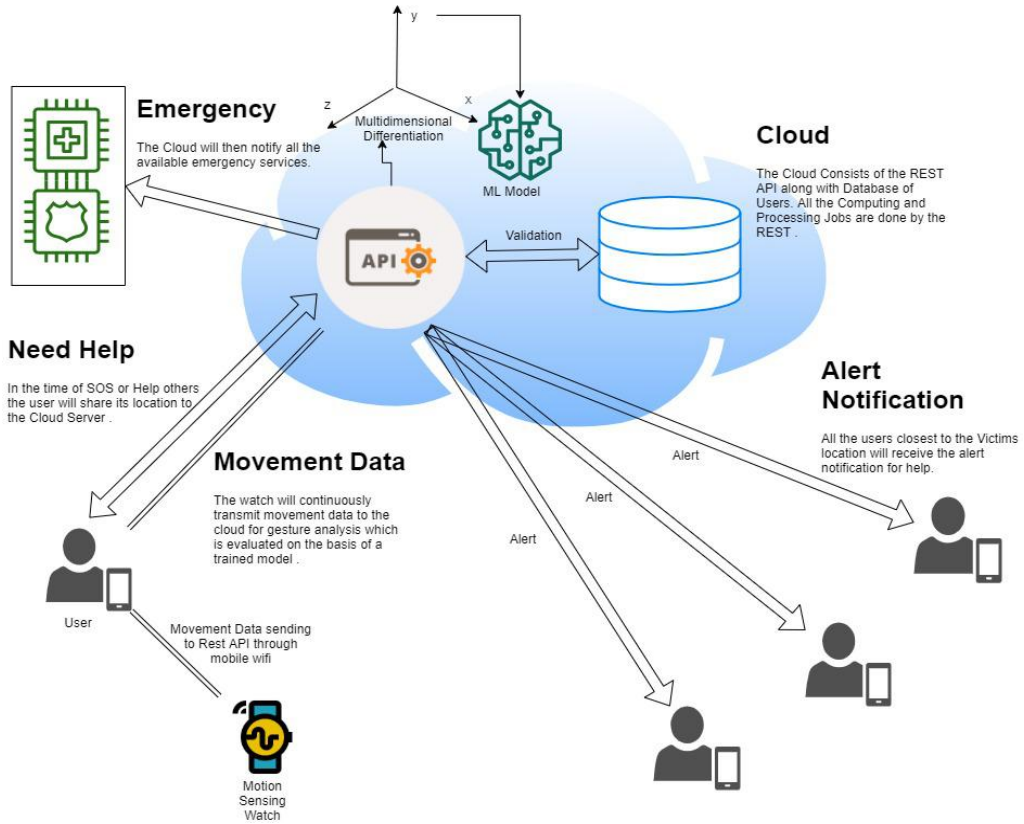



**Figure 6.1: Project Architechture**

## 6.2 Dataset

We have made our own Dataset for the training of our ML model. We have made datasets for the following gestures:-

- Circle Hand Gesture (front & back handed)
- Fall Gesture
- Normal Walking Hand Gesture
- Static Hand Gesture

Accelerometer X Y Z plotting figure 6.2 (Raw Data from sensor) :-

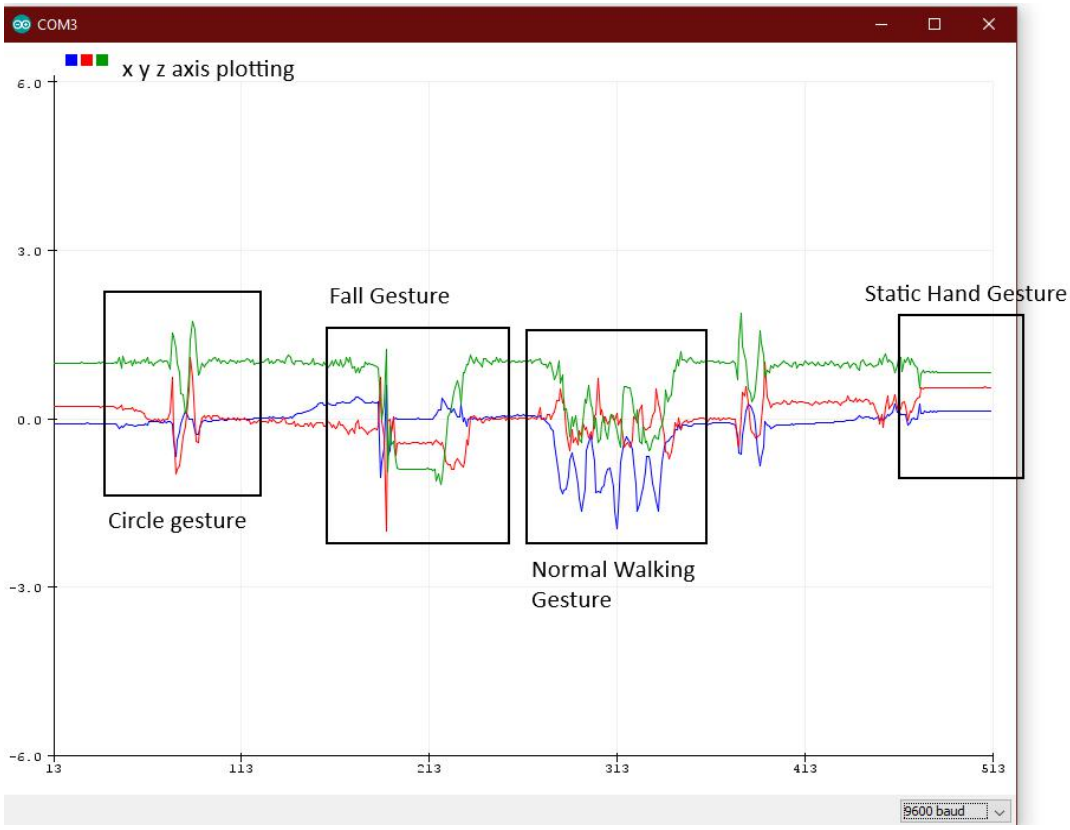



**Figure 6.2: Accelerormeter Plots**

Dataset Format

- Our Dataset consists of nested lists of every iteration of a particular gesture.

- Each Nested List consists of 30 points of accelerometer readings for each Iteration.

For Ex.

[ [[x1,y2,z3],[x2,y2,z3],…..]// 1st Iteration,
[[x1,y2,z3],[x2,y2,z3],….]// 2nd Iteration,
……30th Iterations ]

## 6.3 Preprocessing

The major challenge with our data was the effectiviely visualize the clusters in data. Hence we needed to perform feature tranformation/engineering to analyse the best behaviour of our data. Here in our project we have emphasized more on the temporal features and their behaviour. Hence we have used a multi dimensional differentiation to extract the useful context in our data as shown in figure 6.3.

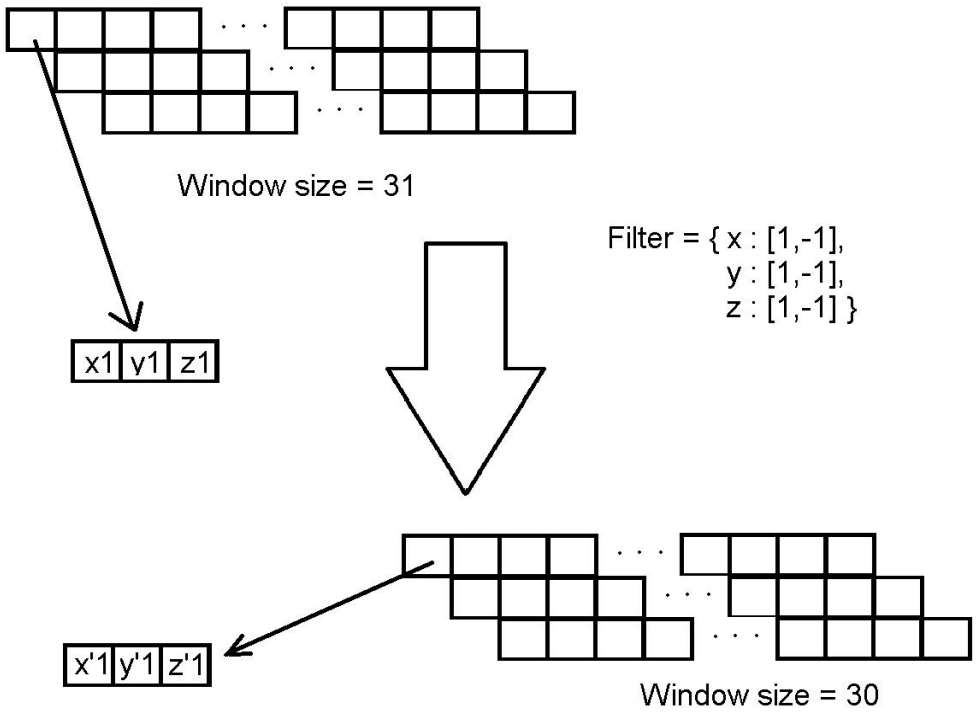



**Figure 6.3: Multidimentional differential**

## 6.4 System Configuration

Our project consists of two core components :

1. Tractiv - Application
2. Motion sensing Watch

We will discussing here about the Motion Sensing Watch system configuration .

The Watch is made up of 2 main components :

1. NodeMCU with the esp8266 Wi-Fi Module
2. MPU6050 gyroscope & accelerometer Module

**NodeMCU :**

**NodeMCU** is an open-source firmware and development kit that helps you to prototype or build IoT products. It includes firmware that runs on the **ESP8266** Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The firmware **uses** the Lua scripting language.

MPU6050:

MPU6050 sensor module is an integrated 6-axis Motion tracking device.

- It has a 3-axis Gyroscope, 3-axis Accelerometer, Digital Motion Processor and a Temperature sensor, all in a single IC.
- It can accept inputs from other sensors like 3-axis magnetometer or pressure sensor using its Auxiliary I2C bus.
- If external 3-axis magnetometer is connected, it can provide complete 9-axis Motion Fusion output.

Gyroscope and accelerometer reading along X, Y and Z axes are available in 2's complement form.

Temperature reading is available in signed integer form (not in 2's complement form).

Gyroscope readings are in degrees per second (dps) unit; Accelerometer readings are in g unit; and Temperature reading is in degrees Celsius.

## 6.5 Training

The dataset was trained by 3 different learning (soft computing) algorithms and their effectiveness was studied. Our model was trained on SVM, logistic regression and random forest classifier with varying hyperparameters.

### 6.5.1 SVM

The parameters state while training are

**{ C=1.0, kernel='rbf', degree=3, gamma='scale', coef0=0.0, shrinking=True, probability=False, tol=0.001, cache_size=200, class_weight=None, verbose=False, max_iter=1, decision_function_shape='ovr', break_ties=False, random_state=None }**

### 6.5.2 Random Forest

The parameters state while training are

**{ penalty='l2', *, dual=False, tol=0.0001, C=1.0, fit_intercept=True, intercept_scaling=1, class_weight=None, random_state=None, solver='lbfgs', max_iter=100, multi_class='auto', verbose=0, warm_start=False, n_jobs=None, l1_ratio=None }**

### 6.5.3 Logistic Regression

The parameters state while training are

**{ n_estimators=100, *, criterion='gini', max_depth=None, min_samples_split=2, min_samples_leaf=1, min_weight_fraction_leaf=0.0, max_features='auto', max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, bootstrap=True, oob_score=False, n_jobs=None, random_state=None, verbose=0, warm_start=False, class_weight=None, ccp_alpha=0.0, max_samples=None }**

# Chapter 7

# Implementation

Implementation refers to process of converting the design/system architechture into indivudual modules and then finally integrating them keeping in mind that all the functional and non functional requirements are met.
The implementation can be subdivided into

- ✧ Creating the Core functionality
- ✧ Creating User Interface
- ✧ Integrating the core functionality to the UI

## 7.1 Creating the Core functionality

The core functionality includes the process of automated detection of human gesture using the sensor data.
The dataset was imported and converted into nested tuples containing a window of 31 concurrent readings from the (acceleratometer) sensor.The data was transformed by a multi dimensional differentiation process, to make the clusters more visible(discussed in section 6.2) . After that the data was fed to a model to determine a hyperplane capable of seperating the clusters.
The clusters formed using our engineered feature is shown in the figure 7.1.

```
def create_data(path):
  Dataset=list()
  for filename in os.listdir(path):
     f = open(os.path.join(path,filename), "r")
     raw_data=f.read()
     lab=get_label(filename)
     raw_data=pre_process_data(raw_data)
     data=align_data_xyz(raw_data)
     ref_data=align_window(data)
     scatterplot(ref_data,filename.split(".")[0]+" before processing")
     processed_data=differentiation(ref_data)
     scatterplot(processed_data,filename.split(".")[0]+" after processing")
     for samples in processed_data:
        Dataset.append([samples,lab])
  return Dataset
```

**code snippet**

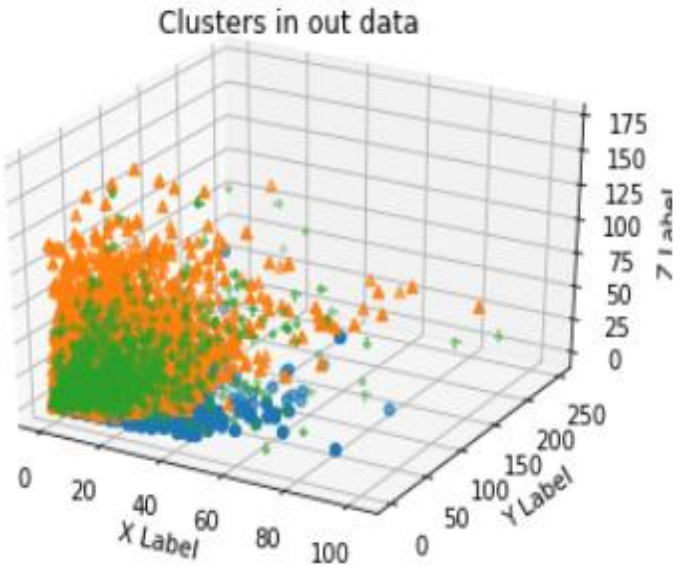



**Figure 7.1: Clusterised Data**

## 7.2 Creating User Interface

The user interface provides with a platform where user can interact with the system.There is a login and a register portal connected to the database.The registration can be done using

a valid email id.One email id can be used only once to ensure that people don't spam.The registered users can login and can enjoy the benifits of peer to peer service.
There are two systems- manual and automated.In the manual system, there are two buttons SOS and Help Others.The SOS button is designed to be pressed in case of emergency.The SOS button whenpressed sends the alert notification to other users in that area providing them with victim's location.
The app provides the facility to see the victim's location .The Help Others button when pressed by others user it opens up a map plotting locations so that they can reach out to help them.
The automated version of the system is also there which sends the central data to the api which is finally embedded with the ML model.
First we implemented static location where both peer's location and victim's location was static while plotting. Then keeping the peer's location static we implemented dynamic location of victim by updating postions on the api and simultaneously updating the map. After that we made both victim's as well as peer's location dynamic for better knowldege of their movement.

## 7.3 Integrating the core functionality to the UI

The UI and the ML model was integrated using rest api hosted in the heroku server. The ML model was hosted along with the rest api, the UI has to make an api call along with passing the data in json format, the tuple will get decoded and passed to the model after carrying out the series of preprocessings. The results from the model will be passed back to the UI wrapped in a similar json structure. The entire implementation is shown in figure 7.2.

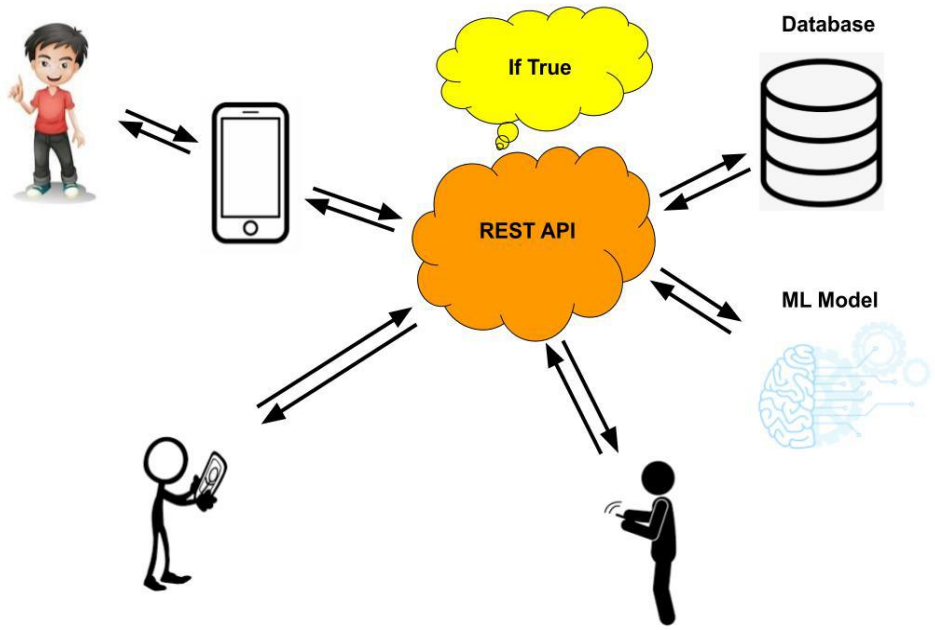



**Figure 7.2: Our Implementation**

# Chapter 8

# System Testing And Result Analysis

## 8.1 Test Cases

| Test Case Title | Test condition | Expected Result | System behaviour |
|---|---|---|---|
| | | | |
| Login | All Blank | Error message should be displayed. | Error messgae was displayed. |
| | Null password | Error message should be displayed. | Error messgae was displayed. |
| | Null Email id | Error message should be displayed. | Error messgae was displayed. |
| | Invalid Email id | Unsucessful login and error message should be displayed. | Error messgae was displayed. |
| | Invalid password | Unsucessful login and error message should be displayed. | Error messgae was displayed. |
| | Invalid password and email id | Unsucessful login and error message should be displayed. | Error messgae was displayed. |
| | Valid password and email id | Successful login. | Login was successful. |
| | | | |
| Register | All Blank | Error message should be displayed. | Error messgae was displayed. |
| | Any Null | Error message should be displayed. | Error messgae was displayed. |
| | Invalid email id | Error message should be displayed and registration unsuccessful. | Error messgae was displayed. |
| | Already used email id | Error message should be displayed and registration unsuccessful. | Error messgae was displayed. |
| | All valid | Successful registration. | Registration was successful. |

| | | | |
|---|---|---|---|
| SOS | On click | Notification should be sent. | Notification was sent. |
| | | | |
| Help Others | On click | Map should open displaying locations. | Map with locations on it opened. |

## 8.2 Result Analysis

The following subsections briefly deals with the result of our machine learning models .

### 8.2.1 Accuracy Comparison

The dataset was trained using different models, the highest accuracy was obtained using logistic regression. The results are shown in the table below.

| | **Model Used** | **Maximum accuracy achieved** |
|---|---|---|
| 1 | Random Forest | 94.18 |
| 2 | SVC | 97.67 |
| **3** | **Logistic Regression** | **98.06** |

The following figures 8.1, 8.2 and 8.3 represent the confusion matrices for the Random Forest, SVC and Logistic Regression respectively.

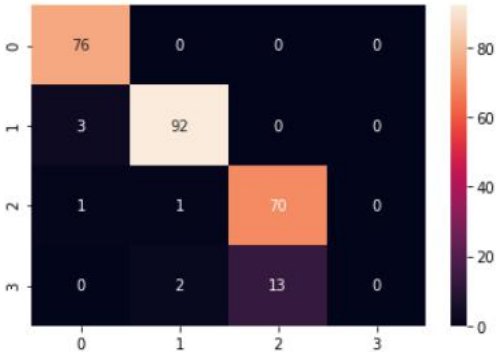



**Figure 8.1 : Random Forest**

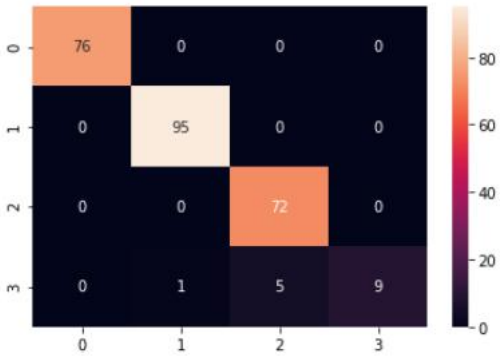



**Figure 8.2 : SVC**

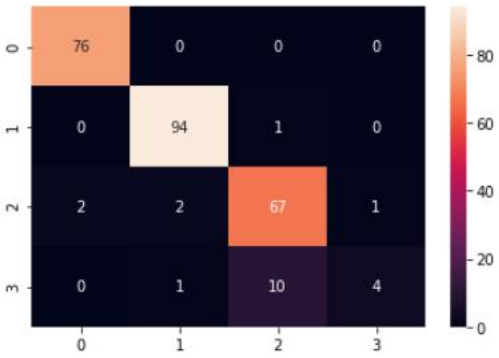



**Figure 8.3 : Logistic Regression**

## 8.2.2 Hyper-parameter Tuning

The number of esimators, cache_size and maximum iterations were tuned on a scale of 10 to 180., in the random forest, SVM and Logistic regression respectively. The resulting change in the accuracy has been plotted in the figure 8.4.

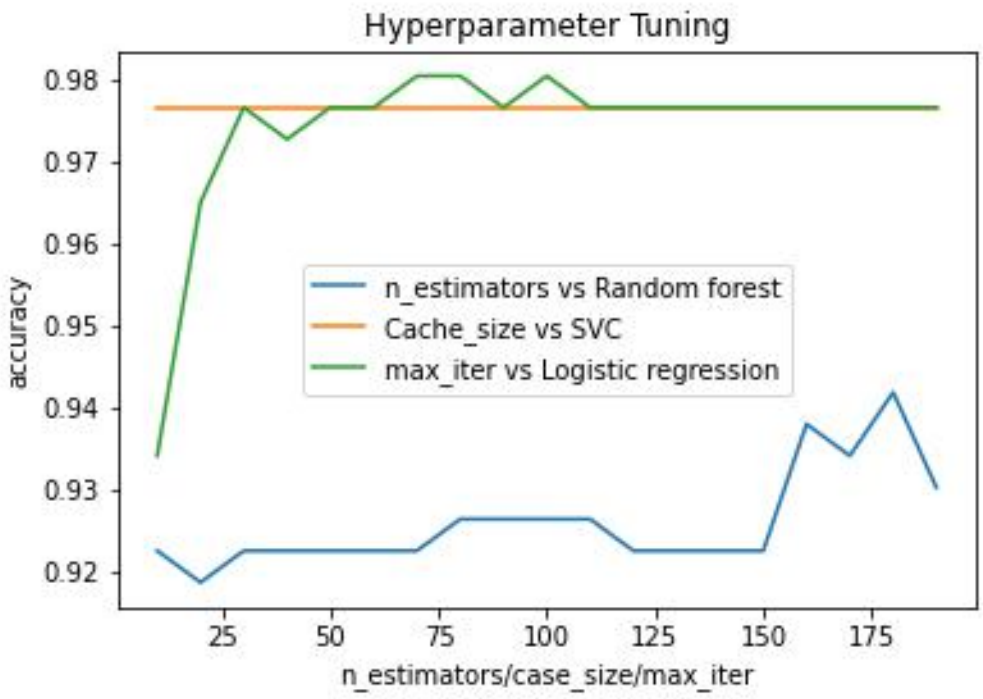



**Figure 8.4: Hyper-parameter Tuning**

# Chapter 9

# Screen shots of Project

## 9.1 Dataset

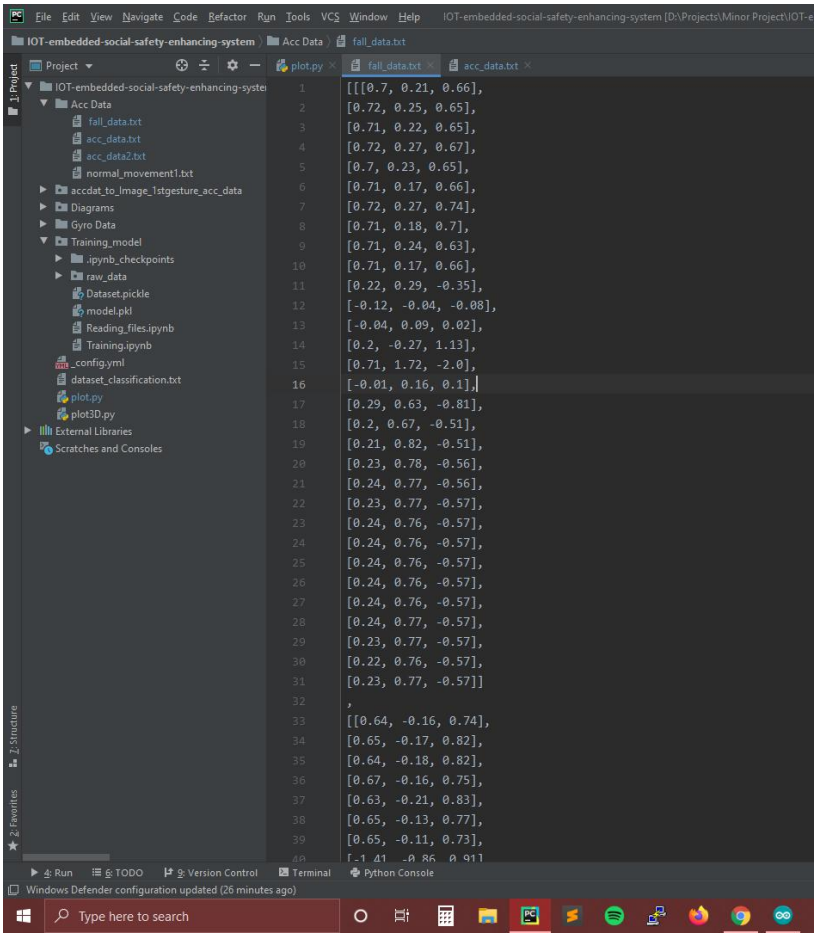
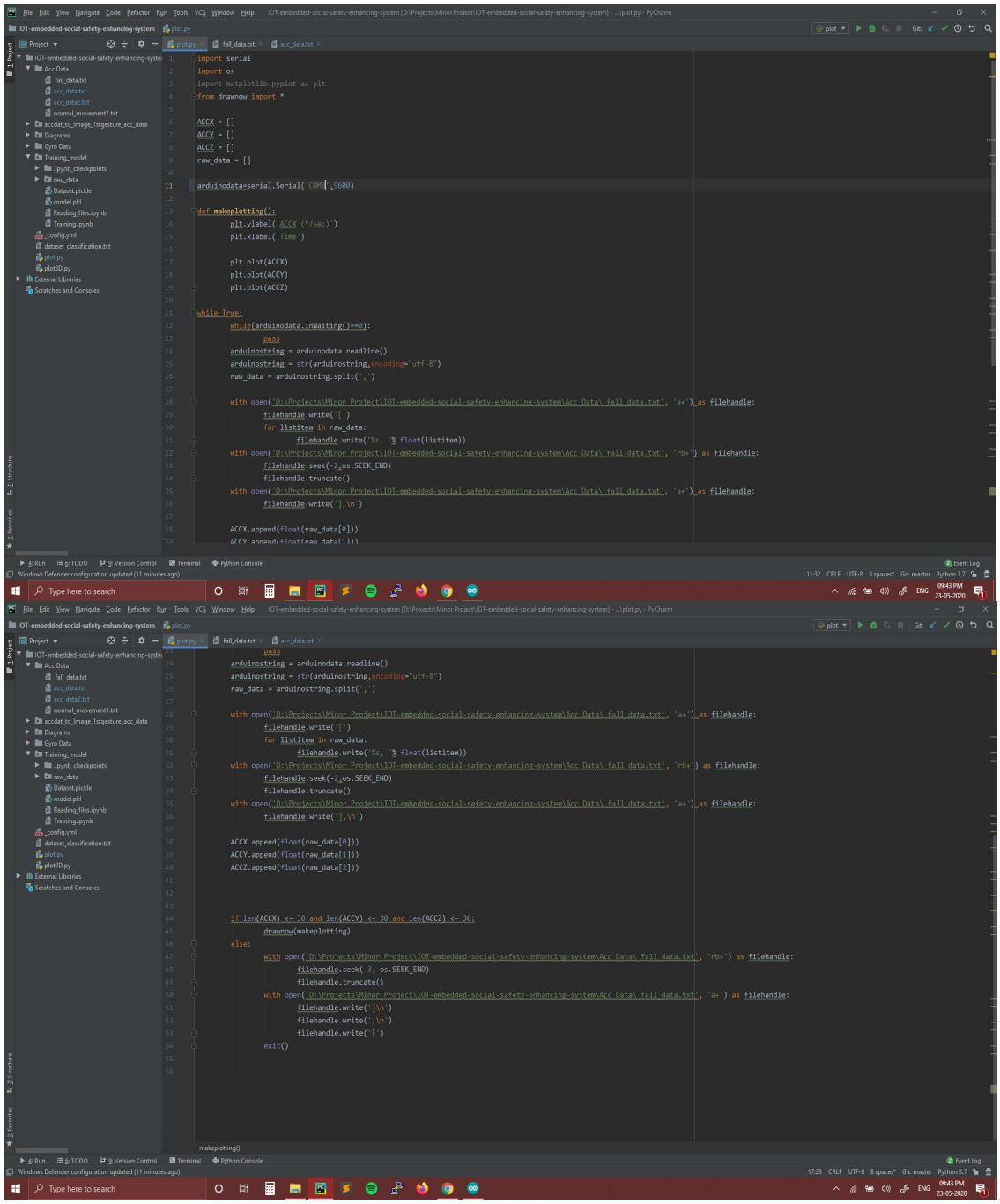



**Figure 9.1: Dataset**



```
import serial
import os
import matplotlib.pyplot as plt
from drawnow import *

ACCX = []
ACCY = []
ACCZ = []
raw_data = []

arduinodata=serial.Serial('COM4',9600)

def makeplotting():
        plt.ylabel('ACCX (°/sec)')
        plt.xlabel('Time')

        plt.plot(ACCX)
        plt.plot(ACCY)
        plt.plot(ACCZ)

while True:
        while(arduinodata.inWaiting()==0):
                pass
        arduinostring = arduinodata.readline()
        arduinostring = str(arduinostring,encoding="utf-8")
        raw_data = arduinostring.split(',')

        with open('D:\Projects\Minor Project\IOT-embedded-social-safety-enhancing-system\Acc Data\ fall_data.txt', 'a+') as filehandle:
                filehandle.write('[')
                for listitem in raw_data:
                        filehandle.write('%s, ' % float(listitem))
        with open('D:\Projects\Minor Project\IOT-embedded-social-safety-enhancing-system\Acc Data\ fall_data.txt', 'rb+') as filehandle:
                filehandle.seek(-2,os.SEEK_END)
                filehandle.truncate()
        with open('D:\Projects\Minor Project\IOT-embedded-social-safety-enhancing-system\Acc Data\ fall_data.txt', 'a+') as filehandle:
                filehandle.write('],\n')

        ACCX.append(float(raw_data[0]))
```

```
        pass
        arduinostring = arduinodata.readline()
        arduinostring = str(arduinostring,encoding="utf-8")
        raw_data = arduinostring.split(',')

        with open('D:\Projects\Minor Project\IOT-embedded-social-safety-enhancing-system\Acc Data\ fall_data.txt', 'a+') as filehandle:
                filehandle.write('[')
                for listitem in raw_data:
                        filehandle.write('%s, ' % float(listitem))
        with open('D:\Projects\Minor Project\IOT-embedded-social-safety-enhancing-system\Acc Data\ fall_data.txt', 'rb+') as filehandle:
                filehandle.seek(-2,os.SEEK_END)
                filehandle.truncate()
        with open('D:\Projects\Minor Project\IOT-embedded-social-safety-enhancing-system\Acc Data\ fall_data.txt', 'a+') as filehandle:
                filehandle.write('],\n')

        ACCX.append(float(raw_data[0]))
        ACCY.append(float(raw_data[1]))
        ACCZ.append(float(raw_data[2]))



        if len(ACCX) <= 30 and len(ACCY) <= 30 and len(ACCZ) <= 30:
                drawnow(makeplotting)
        else:
                with open('D:\Projects\Minor Project\IOT-embedded-social-safety-enhancing-system\Acc Data\ fall_data.txt', 'rb+') as filehandle:
                        filehandle.seek(-3, os.SEEK_END)
                        filehandle.truncate()
                with open('D:\Projects\Minor Project\IOT-embedded-social-safety-enhancing-system\Acc Data\ fall_data.txt', 'a+') as filehandle:
                        filehandle.write(']\n')
                        filehandle.write(',\n')
                        filehandle.write('[')
                exit()
```

**Figure 9.2: Python Code Screenshot for Dataset Preparation**

## 9.2 User Interface

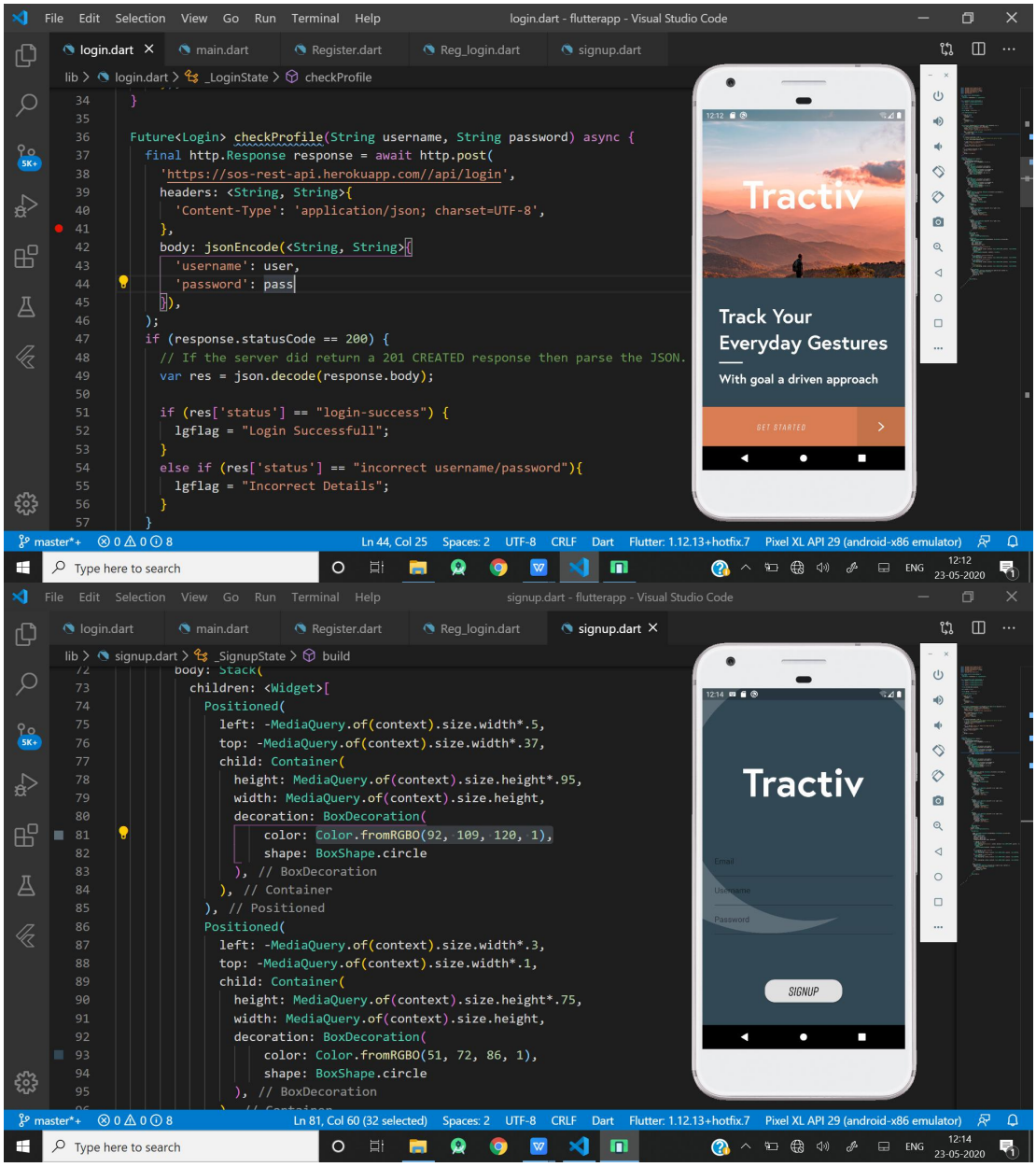



**Figure 9.3 : Project Tractiv User Interface**

## 9.3 Training and Preprocessing

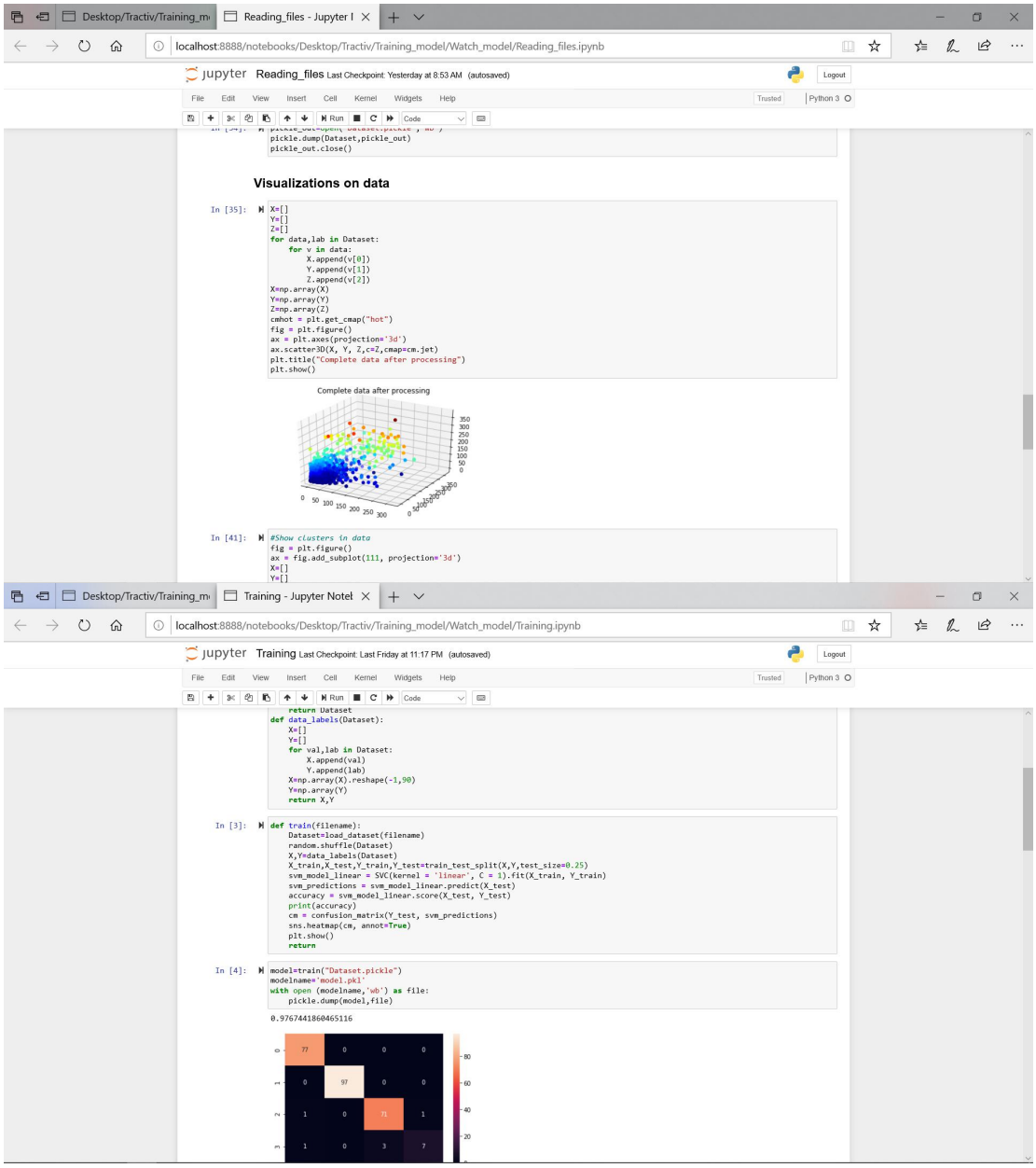



**Figure 9.4 : Data visualization and modelling**

# Chapter 10

# Conclusion and Future Scope

## 10.1 Conclusion

The major issues related to the similar applications are lack of proper database management. Apart from that, the most important feature lacking in these applications is automation. Victims to social injustice doesn't have ample amount of time to open up the application and seek for help or inform their family members about their location. Our approach tries to resolve the issue by implementing automation. The accelerometer and gyroscope sensors of the mobile continuously measures theangular velocity and acceleration. So a particular gesture made using the cell phone can automatically trigger the help centers and the local guardians for help. Apart from that, the victims of the social injustice might not have enough time to access the mobile phones, so we have come up with a smart band which automatically tracks the gestures of the citizens. Any peculiar gesture will trigger the system. We have extended the functionality of this system for the elderly people who have an acute tendency to fall, with their family members left uninformed. The scope of the system includes detection of an accident, in case if anyone meets an accident with the gears on

## 10.2 Future Scope

In the coming future we are confident to increase the accuracy further and include complex actions like firing a gun or hitting with a hockey stick and further classify the category of fall, whether it is relation to any medical issues or any external stimuli.Further we would like to improve our gps navigation system and add more utility to the fitness band. As an extended project we will we working on drones to reach out for immediate help and gather the footage of such areas to begin an invetigation with.

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**All references should be numbered and cited in the content.**


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# SAMPLE INDIVIDUAL CONTRIBUTION REPORT:

## Tractiv - IOT based Social Safety App

Rohit Halder
1705926

**Abstract:** In the project, a light weight computational model integrated with an android app and a smart watch has been developed for effective autonomous monitoring of the citizens while they are walking around in the society/streets, travelling from one place to another leaving behind their parents at home and soon. Unsocial activities or accidents come about without any prior notices. No organisation can effictively monitor the activities of 130 crore population. So the mischief gets unnoticed. Our automated system not only detects the victim, it also traces the his/her current position for the upcoming 30 minutes notifying his/her peers and asking them for help.

**Individual contribution and findings:**
I had a distinct, yet compact role from the days of ideation of the project. I had suggested the automation of the gesture detection while framing the project ideation, followed by development of the automation model. I have engineered the features by applying the multi-dimentional differentiation followed by a comparative study of the models, and choosing the best model. Apart from that, I was a part of the team responsible for integrating the ML model with the rest api, and hosting it online. Apart from that, from time to time, I have distributed the works among the members and the functionalities to be carried out in each phase.

**Individual contribution to project report preparation:**
In the report preparation, I divided the portions among the members and integrated the work. Appart from that, I completed the Introduction, Literature survey, Project planning and Implementation( 7.1, 7.3).

**Individual contribution for project presentation and demonstration:**
As far as the presentation is considered, I was responsible for the designing of the presentation template and demonstration of the parts I am implemented in the project (automation, feature selection).

Full Signature of Supervisor:

……

Full signature of the student:

…Rohit Halder(1705926)…

# SAMPLE INDIVIDUAL CONTRIBUTION REPORT:

## Tractiv - IOT based Social Safety App

SHRISHTI
1705893

**Abstract:** In the project, a light weight computational model integrated with an android app and a smart watch has been developed for effective autonomous monitoring of the citizens while they are walking around in the society/streets, travelling from one place to another leaving behind their parents at home and soon. Unsocial activities or accidents come about without any prior notices. No organisation can effictively monitor the activities of 130 crore population. So the mischief gets unnoticed. Our automated system not only detects the victim, it also traces the his/her current position for the upcoming 30 minutes notifying his/her peers and asking them for help.

### Individual contribution and findings:

In the project, I was responsible for the map integration , Rest api integration along with the implementation of the firebase. I worked on the functionalities of the User Inteface and was a part while designing.

### Individual contribution to project report preparation:

In the report preparation, I completed the System Testing and Result Analysis(8.1),Implementation(7.2),provided with the screenshot of the user Interface.Along with this I helped in final finishing of the report by completing the contents and labelling of the images.

### Individual contribution for project presentation and demonstration:

For project presentation and demostration I am responsible for the parts I have implemented int the project(User Interface) and Project Architechture.

Full Signature of Supervisor:

…….

Full signature of the student:

Shrishti (1705893)

# SAMPLE INDIVIDUAL CONTRIBUTION REPORT:

## Tractiv - IOT based Social Safety App

Shailesh Das
1705819

**Abstract:** In the project, a light weight computational model integrated with an android app and a smart watch has been developed for effective autonomous monitoring of the citizens while they are walking around in the society/streets, travelling from one place to another leaving behind their parents at home and soon. Unsocial activities or accidents come about without any prior notices. No organisation can effectively monitor the activities of 130 crore population. So the mischief gets unnoticed. Our automated system not only detects the victim, it also traces the his/her current position for the upcoming 30 minutes notifying his/her peers and asking them for help

**Individual contribution and findings:** My role in this project was System's Engineer and I designed the motion sensing watch for the gesture detection and also making the dataset for training and analysis for the ML model.

Planning for the development of the motion sensing watch & Dataset :-

- Firstly, Researched online for the required electronics parts for the project
- Made a list of requirements for the gadget engineering
- Then, physically building the watch – which involved soldering of wires, connecting wires in specific terminals of the board, following the pinout diagrams and many more.
- Programming the watch using Arduino IDE for giving the accelerometer readings
- Then, worked in the Dataset designing and building
- After that re-programming the watch for connection with the REST API for motion sensing and gesture classification.

In my process of development I realized the importance of proper planning and testing in the lifecycle of product development and engineering.
Prototyping helps a lot in realizing mistakes made along with the errors in the design of the product.

**Individual contribution to project report preparation:** I was responsible for the System Design Chapter and the System Requirements, Dataset preparation Sub Categories.

**Individual contribution for project presentation and demonstration:** I demonstrating the watch and dataset preparation part and was responsible for the UI in presentation development.

Full Signature of Supervisor: Full signature of the student: Shailesh Das (1705819)

……. ……..

# INDIVIDUAL CONTRIBUTION REPORT

## Tractiv- IOT based Social Safety App

ANUSHMITA DAS
1705924

**Abstract:** In the project, a light weight computational model integrated with an android app and a smartwatch has been developed for the effective autonomous monitoring of the citizens while they are walking around in the society/streets, travelling from one place to another leaving behind their parents at home and soon. Unsocial activities or accidents come about without prior notices. No organization can effectively monitor the activities of the 130 crore population. So the mischief gets unnoticed. Our automated system not only detects the victim, it also traces his/her current position for the upcoming 30 minutes notifying his/her peers and asking them for help.

**Individual contribution and findings:** Our project deals with two components i.e. android app and smart watch as a solution to the issue of safety. I have worked for the designing and functionalities of android app. For the app I have worked with location services / GPS services for the SOS component.I have programmed to collect accelerometer sensor data of phone for the dataset preparation that could have been used for the gesture detection using the app but due to some efficiency constraints and time issue that is not yet implemented. I also have worked for some app UI and helped others with their part in need.

**Individual contribution to project report preparation:** In the project report I have prepared 2 sections. These are-

i) Software Requirements

ii) Requirement Analysis

iii) Activity Diagram

I have mentioned about the purpose of the app, risks involved and also about the functional and non-functional requirements of the app.

## Individual contribution for project presentation and demonstration:

In the presentation I will tell about the problems that arose in our mind for which we determined ourselves to make a solution software for these problems. I will describe the solutions (of the problems) or the functionalities that we come up with. Also I will give a brief description of the IOT system and sensors.

Full signature of the Supervisor : Full signature of the Student :

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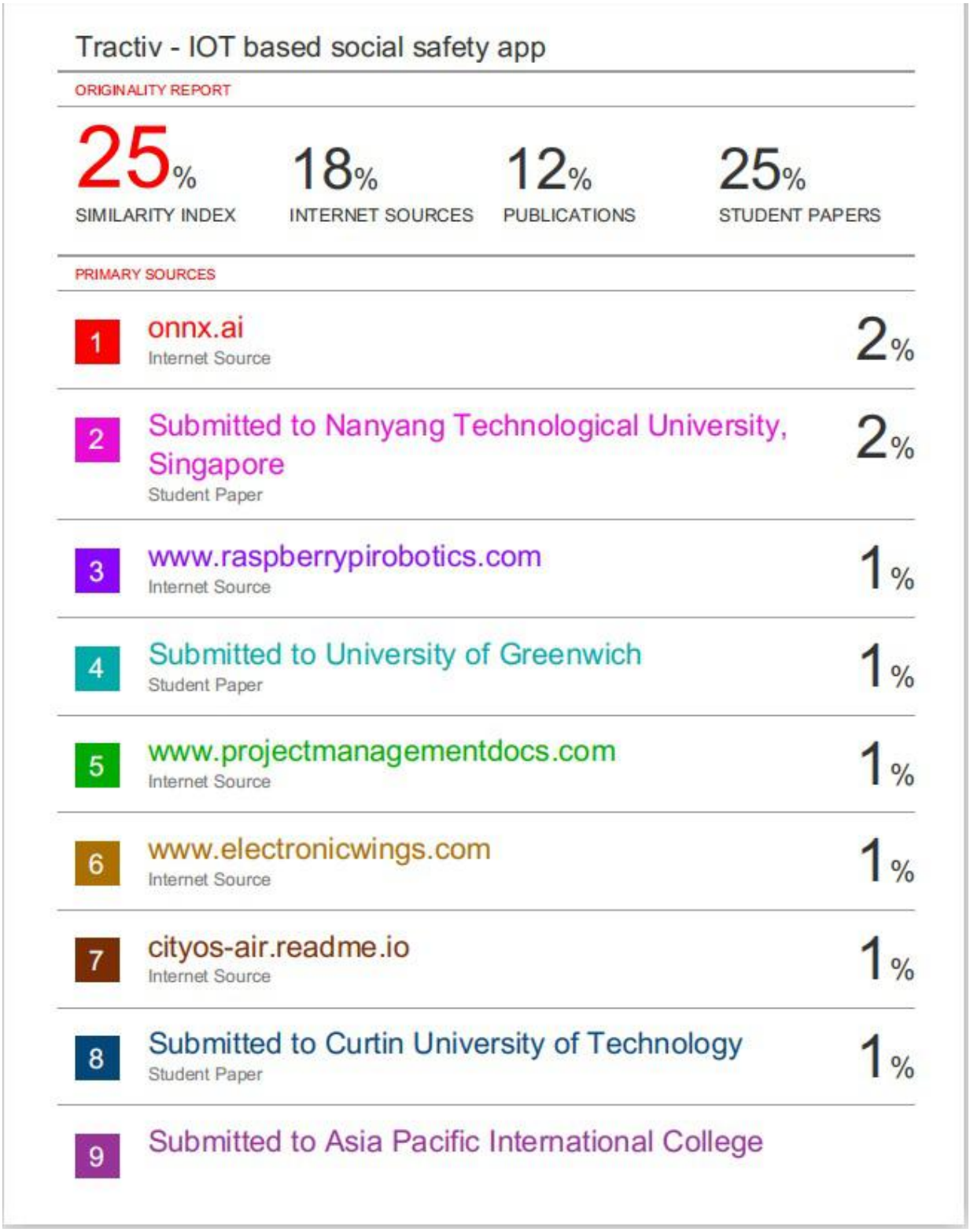
Anushmita Das (1705924)

# TURNITIN PLAGIARISM REPORT



Tractiv - IOT based social safety app

ORIGINALITY REPORT

| 25% | 18% | 12% | 25% |
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