Project: FALL ARM

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Outline

1. Introduction
2. Design
3. Implementation
4. Test / Demo
5. Enhancement Ideas
6. References

INTRODUCTION

- **Fall Detection System Overview**
- **An integrated solution for real-time alerts**

INTRODUCTION

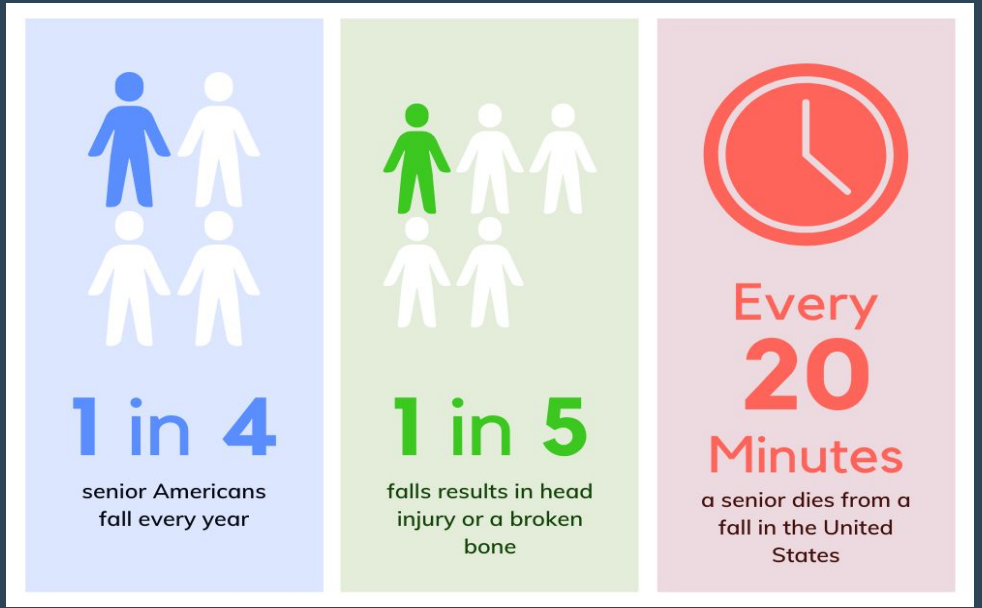
Overview:

INTRODUCTION

- The importance of fall detection.
- Statistics on falls, especially among the elderly.
- The need for an immediate alert system.

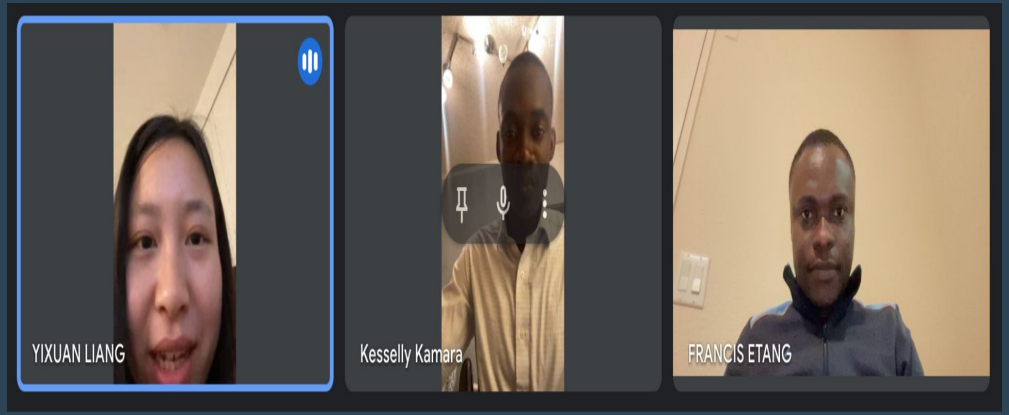
INTRODUCTION

Statistics:



INTRODUCTION

- **Planning**
  - Zoom
  - Google Meet
  - Tools Gathering

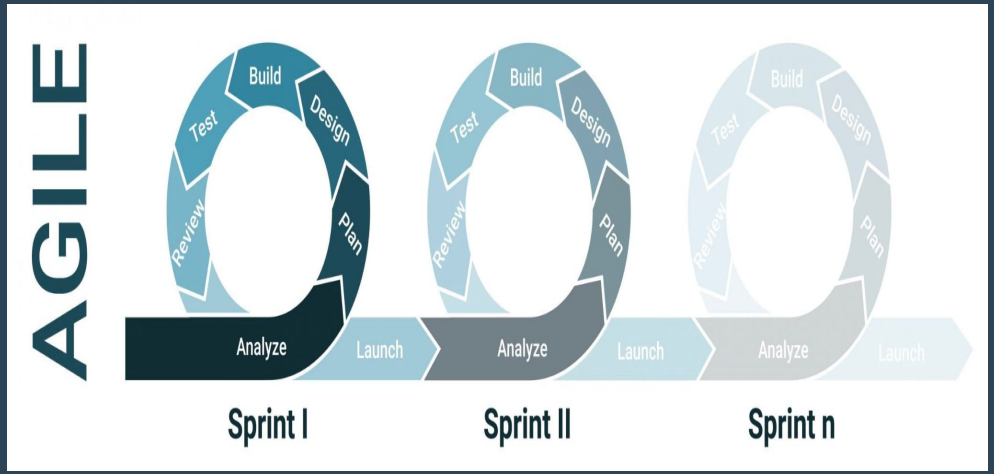


INTRODUCTION

- **Technology**
  - Sensors
  - Java
  - Xml
  - Python
  - Android Studio
  - GitHub

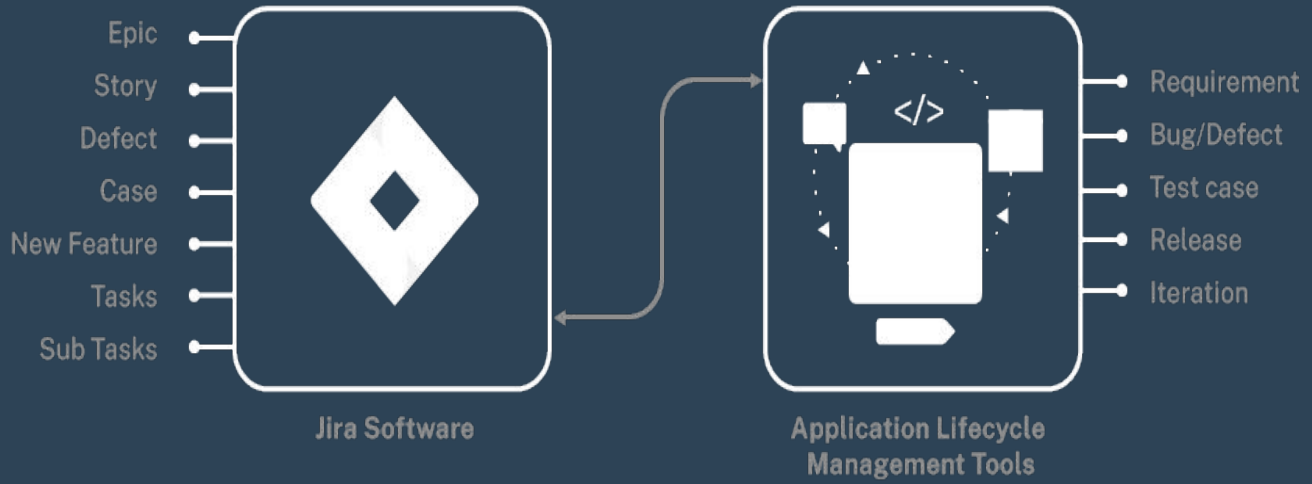
INTRODUCTION

- **Methodology**
  - Agile



AGILE PROJECT MANAGEMENT TOOL

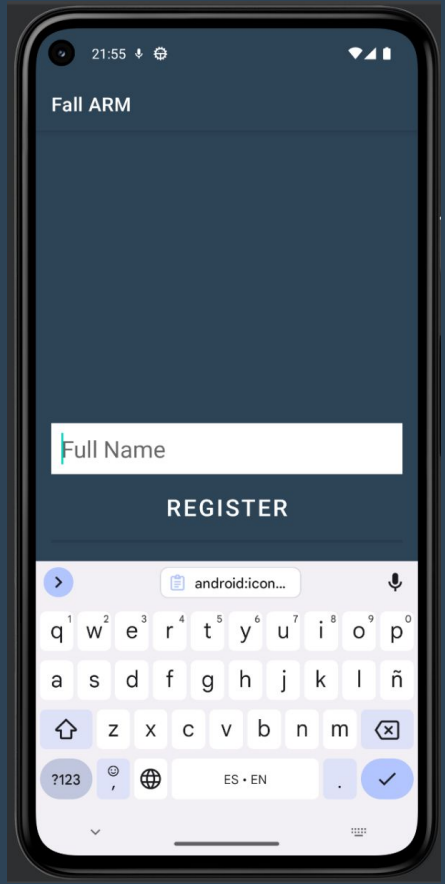
- **Jira**



Design

- **Patient/Elder Person**

Enter Full Name and get unique PatientID

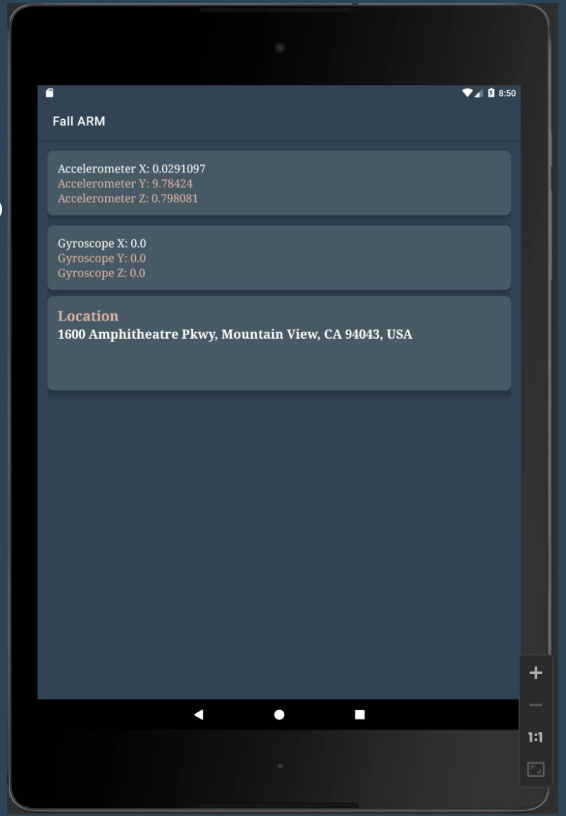


Design

- **Patient/Elder Person**

Dynamically generate Accelerometer and Gyroscope data

Continuously updates the elderly person's geographical location

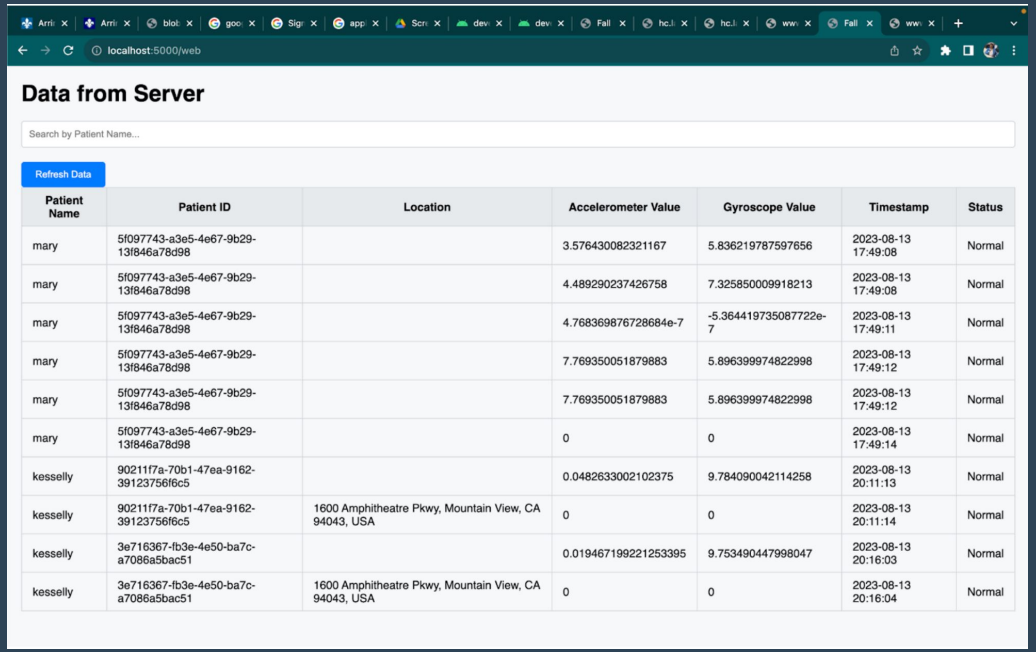


Design

- **IT Department**

Receives sensor data and real time location data.

Determine the type of the motion based on the sensor data.

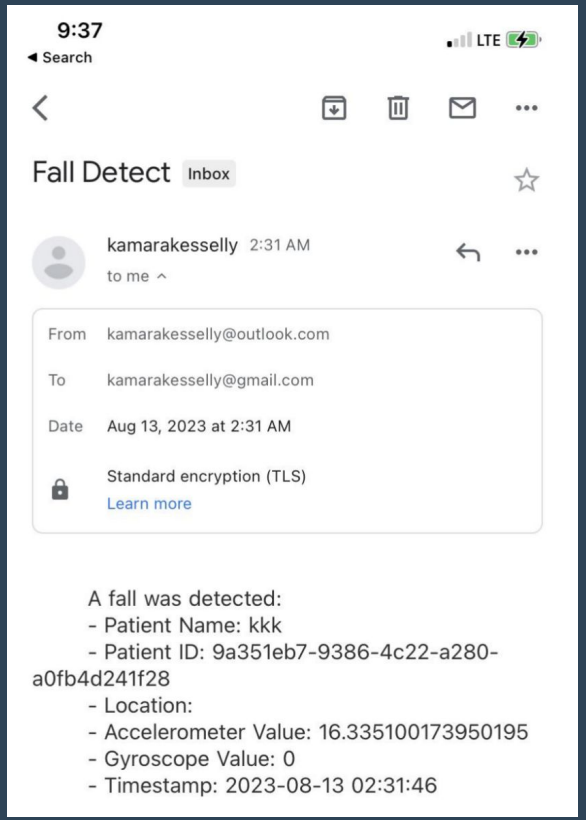


Patient Name	Patient ID	Location	Accelerometer Value	Gyroscope Value	Timestamp	Status
mary	5f097743-a3e5-4e67-9b29-13f846a78d98		3.576430082321167	5.836219787597656	2023-08-13 17:49:08	Normal
mary	5f097743-a3e5-4e67-9b29-13f846a78d98		4.489290237426758	7.325850009918213	2023-08-13 17:49:08	Normal
mary	5f097743-a3e5-4e67-9b29-13f846a78d98		4.7683698767286 84e-7	-5.364419735087722e-7	2023-08-13 17:49:11	Normal
mary	5f097743-a3e5-4e67-9b29-13f846a78d98		7.769350051879883	5.896399974822998	2023-08-13 17:49:12	Normal
mary	5f097743-a3e5-4e67-9b29-13f846a78d98		7.769350051879883	5.896399974822998	2023-08-13 17:49:12	Normal
mary	5f097743-a3e5-4e67-9b29-13f846a78d98		0	0	2023-08-13 17:49:14	Normal
kesselly	90211f7a-70b1-47ea-9162-39123756f6c5		0.0482633002102375	9.784090042114258	2023-08-13 20:11:13	Normal
kesselly	90211f7a-70b1-47ea-9162-39123756f6c5	1600 Amphitheatre Pkwy, Mountain View, CA 94043, USA	0	0	2023-08-13 20:11:14	Normal
kesselly	3e716367-fb3e-4e50-ba7c-a7086a5bac51		0.019467199221253395	9.753490447998047	2023-08-13 20:16:03	Normal
kesselly	3e716367-fb3e-4e50-ba7c-a7086a5bac51	1600 Amphitheatre Pkwy, Mountain View, CA 94043, USA	0	0	2023-08-13 20:16:04	Normal

Design

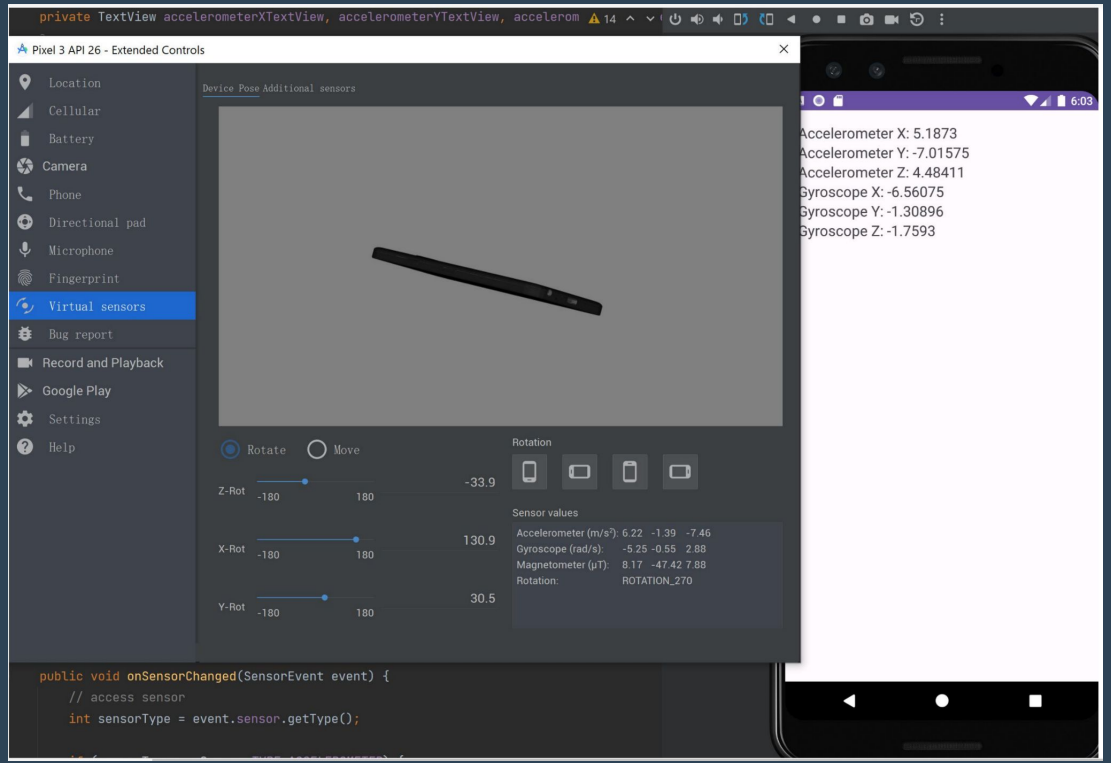
- **Nurse/Third Party**

If we detect the patient falls down, ask the nurse to come to rescue by sending an email.



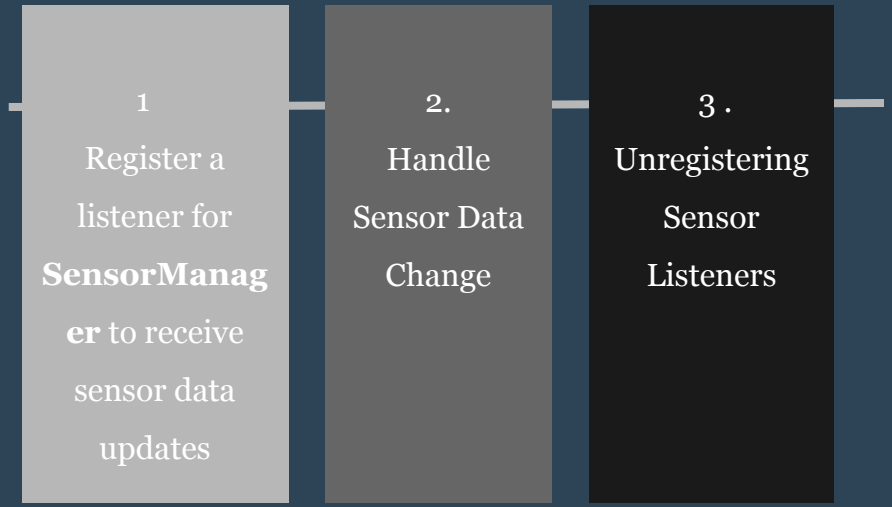
IMPLEMENTATION

- **Part 1 : Generate Accelerometer and Gyroscope data**


private TextView accelerometerXTextView, accelerometerYTextView, accelerom
Pixel 3 API 26 - Extended Controls
Location
Cellular
Battery
Camera
Phone
Directional pad
Microphone
Fingerprint
Virtual sensors
Bug report
Record and Playback
Google Play
Settings
Help
Device Pose Additional sensors
Rotate
Move
Rotation
Z-Rot
-180
180
-33.9
X-Rot
-180
180
130.9
Y-Rot
-180
180
30.5
Sensor values
Accelerometer (m/s²): 6.22 -1.39 -7.46
Gyroscope (rad/s): -5.25 -0.55 2.88
Magnetometer (μT): 8.17 -47.42 7.88
Rotation: ROTATION_270
public void onSensorChanged(SensorEvent event) {
// access sensor
int sensorType = event.sensor.getType();
6:03
Accelerometer X: 5.1873
Accelerometer Y: -7.01575
Accelerometer Z: 4.48411
Gyroscope X: -6.56075
Gyroscope Y: -1.30896
Gyroscope Z: -1.7593

Code Overview

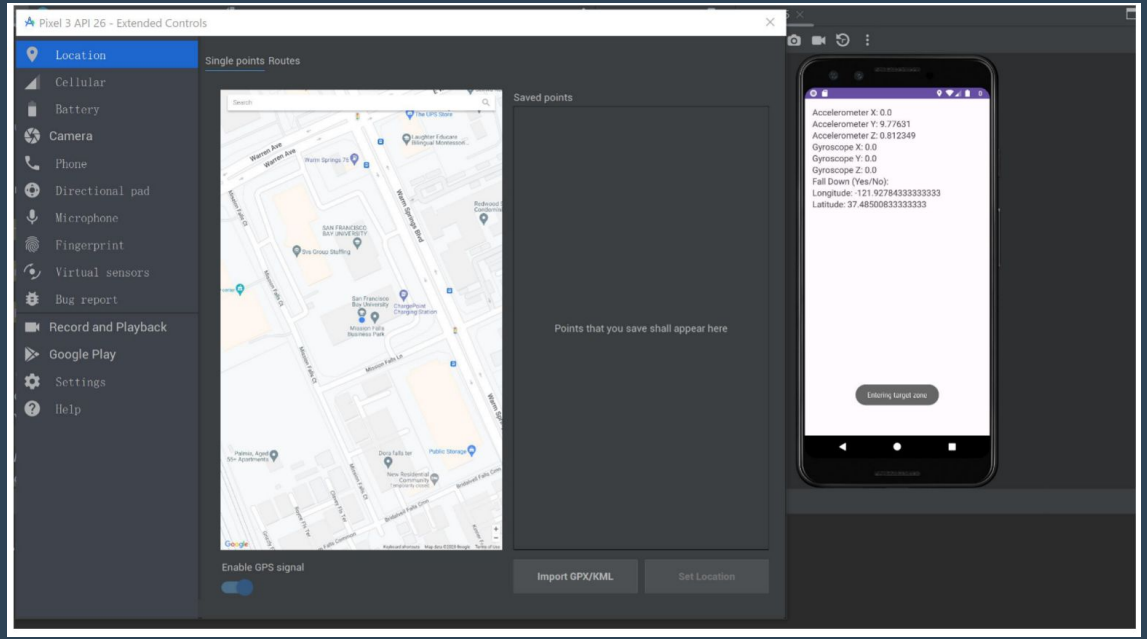
Use built-in sensor simulator to generate continuous data



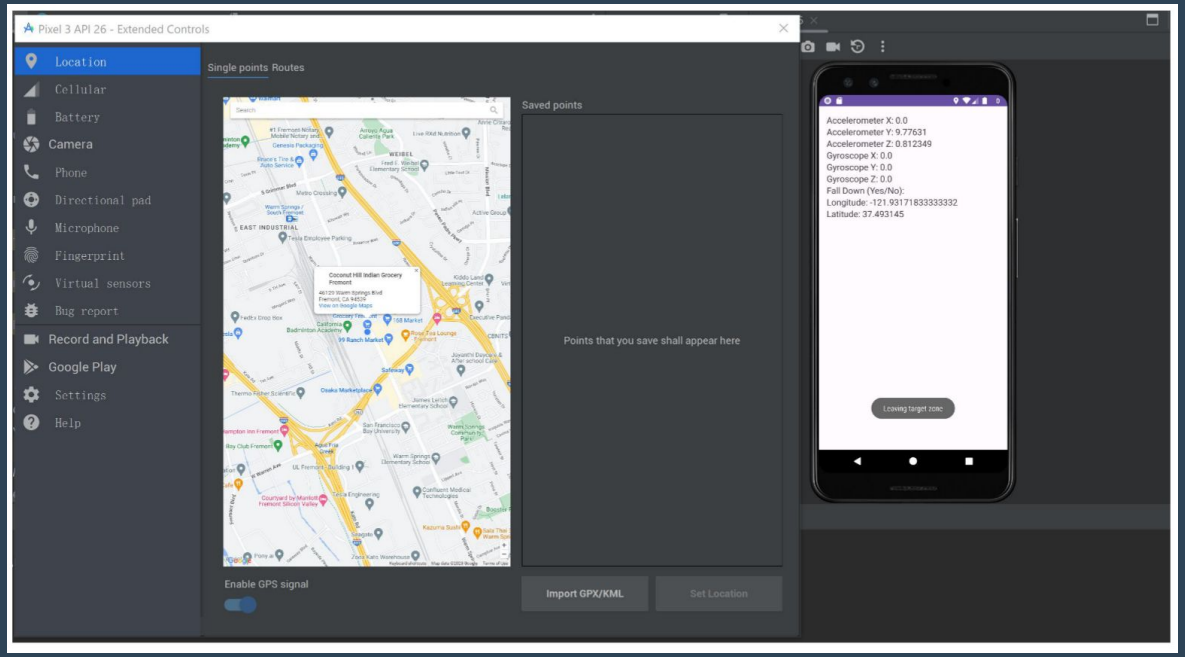
IMPLEMENTATION

- **Part 2 : Find the location of the patient**

Move into the area



Move out of the area



IMPLEMENTATION

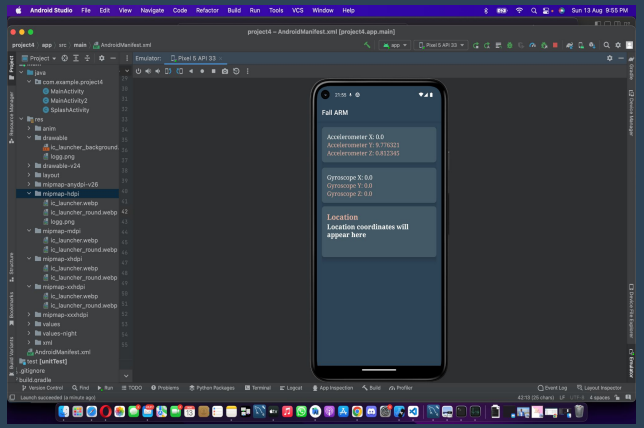
- **Part 3 : Send Data to Server**
- **Part4: Notice Nurse**

Components

- **Mobile Application: Captures sensor data and sends it to the server.**
- **Server: Processes the data, stores it, and triggers alerts.**
- **Email Notification System: Sends email alerts based on detected conditions.**

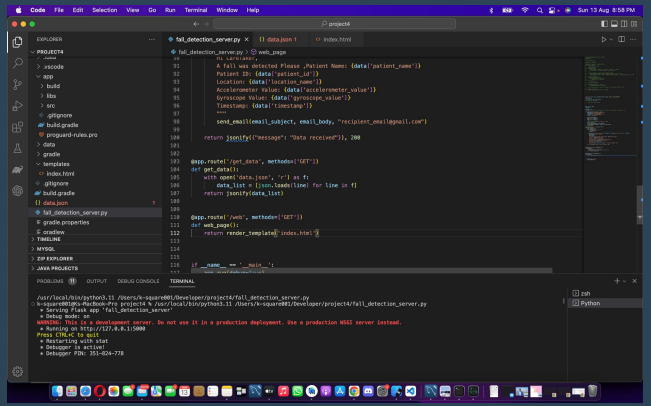
Mobile Application

- Captures data from built-in sensors.
- Sends data to the server periodically or upon certain conditions.
- Highlights: Real-time monitoring, location tracking, user-friendly interface.



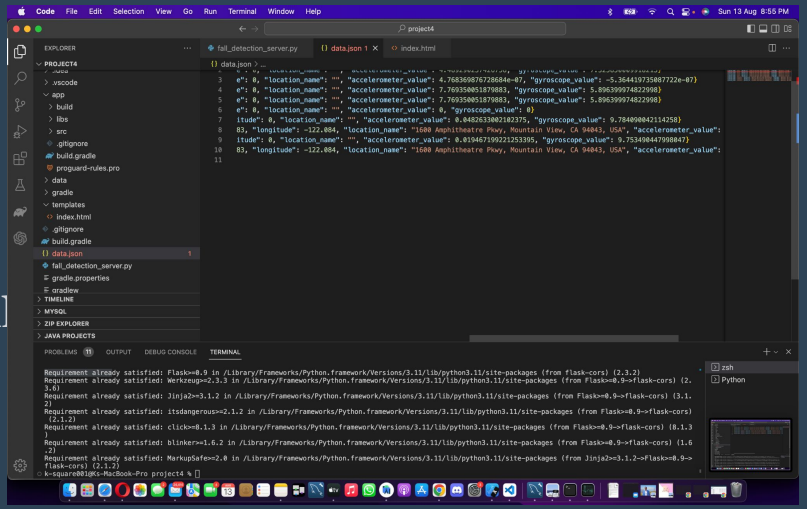
Data Transfer

- Use of the POST method to send data to the server endpoint.
- A brief introduction to the JSON format for data representation.
- Security considerations during data transfer.



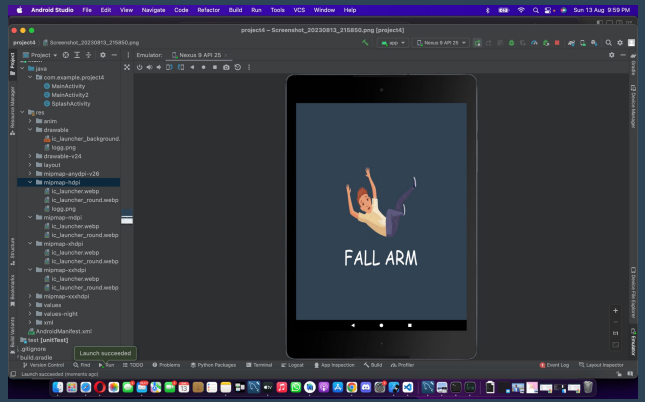
Server-side Processing

- Flask-based web application.
- Data is saved to data.json for persistence.
- Real-time analysis of incoming data for fall detection.



Fall Detection Algorithm

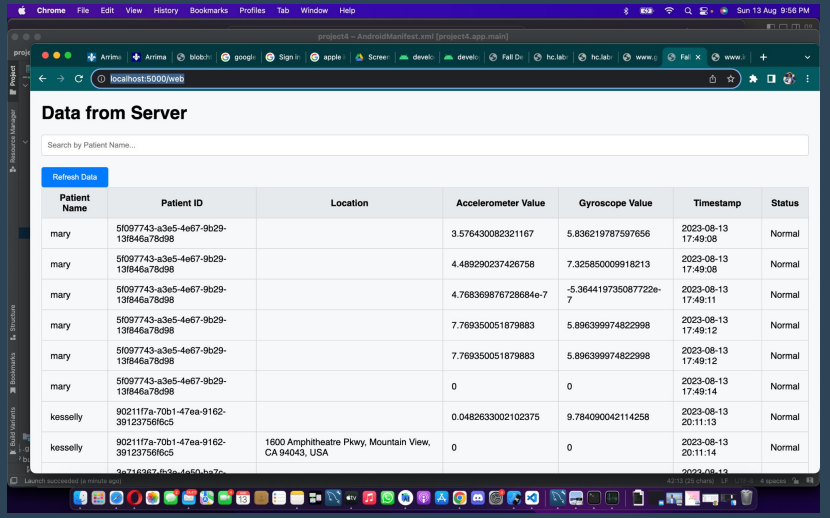
- The significance of accelerometer and gyroscope values.
- Introduction to the threshold concept (THRESHOLD).
- Conditional checks to detect falls.



Future Enhancement

- **Integrating with other notification systems (SMS, push notifications).**
- **Machine learning models for more accurate fall detection.**
- **User feedback mechanism to verify falls or false alarms.**

Conclusion



- Recap of the importance of the Fall Detection System.
- The significance of early and timely notifications.
- Encourage feedback and open the floor for questions.

Test Result

- Email verification
- Position Changes

Test

SHOW DEMO

Reference:

https://github.com/kesselly4099/Fall-Arm.git

https://hc.labnet.sfbu.edu/~henry/sfbu/course/capstone/android/slide/exercise_android.html

flask Web Framework:

- Grinberg, Miguel. *Flask Web Development: Developing Web Applications with Python*. O'Reilly Media, 2018.
- Official Flask Documentation

SMTP and Email Sending:

- Python smtplib documentation
- Outlook SMTP settings

Fall Detection:

- Nait-Charif, Hammadi, and Samantha J. McKenzie. "Elderly fall detection using human shape features." *IET Computer Vision* 10.6 (2016): 532-539.

Volley for Network Requests:

- Official Android Developer Documentation on Volley

JSON and Data Handling:

- Crockford, Douglas. "The application/json Media Type for JavaScript Object Notation (JSON)." (2006).
- Official JSON Website

CORS (Cross-Origin Resource Sharing):

- Mozilla Developer Network (MDN) on CORS

Thank You!