



1. Get accelerometer movement data
2. Build KNN model
3. Ran server
4. Open APP

#### Activity\_main.xml

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:padding="10dp"
    tools:context=".MainActivity">
    <LinearLayout
        android:layout_width="match_parent"
        android:layout_height="match_parent"
        android:gravity="center"
        android:orientation="vertical"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0">
        <LinearLayout
            android:layout_width="match_parent"
            android:layout_height="wrap_content">
            <TextView
                android:layout_width="match_parent"
                android:layout_height="35dp"
                android:layout_margin="1dp"
                android:layout_weight="1"
                android:gravity="left"
                android:text="Patient ID"
```

```

        android:textColor="#268EBD"
        android:textSize="28dp"></TextView>
    <EditText
        android:id="@+id/patienID_Edittext"
        android:layout_width="match_parent"
        android:layout_height="45dp"
        android:layout_margin="1dp"
        android:layout_weight="1"
        android:gravity="left"
        android:text="01"
        android:textColor="#268EBD"
        android:textSize="15dp"></EditText>
</LinearLayout>

<LinearLayout
    android:layout_width="match_parent"
    android:layout_height="wrap_content">
    <TextView
        android:layout_width="match_parent"
        android:layout_height="35dp"
        android:layout_margin="1dp"
        android:layout_weight="1"
        android:gravity="left"
        android:text="Phone No."
        android:textColor="#268EBD"
        android:textSize="28dp"></TextView>
    <EditText
        android:id="@+id/phone_Edittext"
        android:layout_width="match_parent"
        android:layout_height="35dp"
        android:layout_margin="1dp"
        android:layout_weight="1"
        android:gravity="left"
        android:text="123456789"
        android:textColor="#268EBD"
        android:textSize="15dp"></EditText>
</LinearLayout>

<LinearLayout
    android:layout_width="match_parent"
    android:layout_height="wrap_content">
    <TextView
        android:layout_width="match_parent"
        android:layout_height="35dp"
        android:layout_margin="1dp"
        android:layout_weight="1"
        android:gravity="left"
        android:text="Location"
        android:textColor="#268EBD"
        android:textSize="28dp"></TextView>
</LinearLayout>
<LinearLayout
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:layout_margin="1dp"
    android:gravity="center"
    android:orientation="horizontal"

```

```

        android:weightSum="2">
        <TextView
            android:layout_width="match_parent"
            android:layout_height="30dp"
            android:layout_margin="1dp"
            android:layout_weight="1"
            android:gravity="right"
            android:text="Latitude:"
            android:textSize="24dp"></TextView>
        <TextView
            android:id="@+id/latitude_textView"
            android:layout_width="match_parent"
            android:layout_height="30dp"
            android:layout_margin="1dp"
            android:layout_weight="1"
            android:textSize="24dp"
            android:gravity="center"
            android:text="0"></TextView>
    </LinearLayout>
    <LinearLayout
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:layout_margin="1dp"
        android:gravity="center"
        android:orientation="horizontal"
        android:weightSum="2">
        <TextView
            android:layout_width="match_parent"
            android:layout_height="30dp"
            android:layout_margin="1dp"
            android:layout_weight="1"
            android:gravity="right"
            android:text="Longitude:"
            android:textSize="24dp"></TextView>
        <TextView
            android:id="@+id/longitude_textView"
            android:layout_width="match_parent"
            android:layout_height="30dp"
            android:layout_margin="1dp"
            android:layout_weight="1"
            android:textSize="24dp"
            android:gravity="center"
            android:text="0"></TextView>
    </LinearLayout>

    <LinearLayout
        android:layout_width="match_parent"
        android:layout_height="wrap_content">

        <TextView
            android:layout_width="match_parent"
            android:layout_height="45dp"
            android:layout_margin="1dp"
            android:layout_weight="1"
            android:gravity="left"
            android:text="Sensor Values"
            android:textColor="#268EBD"

```

```

        android:textSize="28dp" />
</LinearLayout>
<LinearLayout
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:layout_margin="1dp"
    android:gravity="center"
    android:orientation="horizontal"
    android:weightSum="2">

    <TextView
        android:layout_width="match_parent"
        android:layout_height="30dp"
        android:layout_margin="1dp"
        android:layout_weight="1"
        android:gravity="right"
        android:text="X:"
        android:textSize="28dp" />

    <TextView
        android:id="@+id/x_value"
        android:layout_width="match_parent"
        android:layout_height="30dp"
        android:layout_margin="1dp"
        android:layout_weight="1"
        android:textSize="28dp"
        android:gravity="center"
        android:text="0" />
</LinearLayout>
<LinearLayout
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:layout_margin="1dp"
    android:gravity="center"
    android:orientation="horizontal"
    android:weightSum="2">

    <TextView
        android:layout_width="match_parent"
        android:layout_height="30dp"
        android:layout_margin="1dp"
        android:layout_weight="1"
        android:gravity="right"
        android:text="Y:"
        android:textSize="28dp" />

    <TextView
        android:id="@+id/y_value"
        android:layout_width="match_parent"
        android:layout_height="30dp"
        android:layout_margin="1dp"
        android:layout_weight="1"
        android:textSize="28dp"
        android:gravity="center"
        android:text="0" />
</LinearLayout>
<LinearLayout

```

```

        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:layout_margin="1dp"
        android:gravity="center"
        android:orientation="horizontal"
        android:weightSum="2">

        <TextView
            android:layout_width="match_parent"
            android:layout_height="30dp"
            android:layout_margin="1dp"
            android:layout_weight="1"
            android:gravity="right"
            android:text="Z:"
            android:textSize="28dp" />

        <TextView
            android:id="@+id/z_value"
            android:layout_width="match_parent"
            android:layout_height="30dp"
            android:layout_margin="1dp"
            android:layout_weight="1"
            android:textSize="28dp"
            android:gravity="center"
            android:text="0" />

    </LinearLayout>

    <Button
        android:id="@+id/send"
        android:layout_width="fill_parent"
        android:layout_height="wrap_content"
        android:text="Send"
    />

    <LinearLayout
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:layout_margin="1dp"
        android:gravity="center"
        android:orientation="horizontal"
        android:weightSum="2">

        <TextView
            android:layout_width="match_parent"
            android:layout_height="30dp"
            android:layout_margin="1dp"
            android:layout_weight="1"
            android:gravity="right"
            android:text="Movement:"
            android:textSize="28dp" />

        <TextView
            android:id="@+id/movement_value"
            android:layout_width="match_parent"
            android:layout_height="30dp"

```

```

        android:layout_margin="1dp"
        android:layout_weight="1"
        android:textSize="28dp"
        android:gravity="center" />
    </LinearLayout>
</LinearLayout>
</androidx.constraintlayout.widget.ConstraintLayout>

```

## MainActivity.java

```

package com.example.sms;

import android.content.Context;
import android.hardware.Sensor;
import android.hardware.SensorEvent;
import android.hardware.SensorEventListener;
import android.hardware.SensorManager;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.TextView;

import androidx.appcompat.app.AppCompatActivity;

import java.io.DataInputStream;
import java.io.DataOutputStream;
import java.io.IOException;
import java.net.Socket;

public class MainActivity extends AppCompatActivity {
    // declare X,Y,Z axis object
    private TextView xValue;
    private TextView yValue;
    private TextView zValue;
    private SensorManager sensorManager;
    private SQLiteDatabase mySQLHelper;
    private List<DataBean> dataList;
    private TextView movementView;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        xValue = (TextView) findViewById(R.id.x_value);
        yValue = (TextView) findViewById(R.id.y_value);
        zValue = (TextView) findViewById(R.id.z_value);
        movementView = (TextView) findViewById(R.id.movement_value);
        sensorManager = (SensorManager)
getSystemService(Context.SENSOR_SERVICE);
        int sensorType = Sensor.TYPE_ACCELEROMETER;
        sensorManager.registerListener(myAccelerometerListener,

sensorManager.getDefaultSensor(sensorType), SensorManager.SENSOR_DELAY_NORMAL)
;
        Button buttonSend = (Button) findViewById(R.id.send);
        buttonSend.setOnClickListener(buttonSendOnClickListener);
    }
}

```

```

    }
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        movementView = findViewById(R.id.movement_TextView);
        initDB();
        getLocation();
        getSensorValue();
        getDB();
        k_value = (int)Math.sqrt(dataList.size());
    }
    final SensorEventListener myAccelerometerListener = new
    SensorEventListener(){
        public void onSensorChanged(SensorEvent sensorEvent){
            if(sensorEvent.sensor.getType() == Sensor.TYPE_ACCELEROMETER){
                float X_lateral = sensorEvent.values[0];
                float Y_longitudinal = sensorEvent.values[1];
                float Z_vertical = sensorEvent.values[2];
                xValue.setText(String.valueOf(X_lateral));
                yValue.setText(String.valueOf(Y_longitudinal));
                zValue.setText(String.valueOf(Z_vertical));
            }
        }
        public void onAccuracyChanged(Sensor sensor , int accuracy){
        }
    };
    public void onPause(){
        /*
        * Even activity is pause, sensor will still work, to save the power of the
        phone, will make this onPause
        * But if is using for nursing home, should not include this part, sensor
        needs
        to work all the time
        * */
        sensorManager.unregisterListener(myAccelerometerListener);
        super.onPause();
    }
    void initDB() {
        mySQLHelper = new SQLiteDB(this);
        //Stetho.initializeWithDefaults(this);
        try {
            InputStreamReader file = null;
            file = new
InputStreamReader(getAssets().open("fallingData.csv"));
            BufferedReader buffer = new BufferedReader(file);
            String line = "";
            while ((line = buffer.readLine()) != null) {
                Log.e("line", line);
                String[] str = line.split(",");
                float x = Float.parseFloat(str[0].toString());
                float y = Float.parseFloat(str[1].toString());
                float z = Float.parseFloat(str[2].toString());
                String c = str[3].toString();
                Log.e("line", x+y+z+c);
                mySQLHelper.insertRecord(x, y, z, c);
                Log.e("Import", "Successfully Updated Database.");
            }
        }
    }

```

```

        } catch (IOException e) {
            Log.e("SQLException", e.getMessage().toString());
        }
    }

    void getDB() {
        Log.e("ShowData", "making list");
        dataList = mySQLHelper.queryRecord();
        Log.e("ShowData", "done list");
    }

    void isfalling_KNN(float x2, float y2, float z2) {
        PriorityQueue<DistanceData> heap = new
        PriorityQueue<DistanceData>(new
            Comparator<DistanceData>() {
                public int compare(DistanceData a, DistanceData b) { return
                    (int) (a.getDistance()-b.getDistance()); }
            });
        for (int i = 0; i < dataList.size(); i++) {
            float x1 = dataList.get(i).getX();
            float y1 = dataList.get(i).getY();
            float z1 = dataList.get(i).getZ();
            float distance_temp = (float) distance(x1,y1,z1,x2,y2,z2);
            heap.offer(new DistanceData(distance_temp,
dataList.get(i).getClass_(),0));
        }
        HashMap<String, Integer> classcount = new HashMap<String, Integer>();
        for (int i = 0; i < k_value; i++) {
            DistanceData tempData = heap.poll();
            if(!classcount.containsKey(tempData.getClass_())){
                classcount.put(tempData.getClass_(), 1);
            } else {
                classcount.put(tempData.getClass_(),
                    classcount.get(tempData.getClass_())+1);
            }
        }
        PriorityQueue<DistanceData> knn_return = new
        PriorityQueue<DistanceData>(new
            Comparator<DistanceData>() {
                public int compare(DistanceData a, DistanceData b) { return
                    (int) (a.getCount_()-b.getCount_()); }
            });
        Iterator classcountIterator = classcount.entrySet().iterator();
        while (classcountIterator.hasNext()) {
            Map.Entry mapElement
                = (Map.Entry)classcountIterator.next();
            DistanceData tempData = new DistanceData(0,
String.valueOf(mapElement.getKey()), (int)mapElement.getValue());
            knn_return.offer(tempData);
        }
        movementResult = knn_return.poll().getClass_();
        movementView.setText(movementResult);
        Log.e("Movement", movementResult);
        sentToServer();
    }

    void sentToServer() {
        StrictMode.ThreadPolicy policy = new

```



```

StrictMode.ThreadPolicy.Builder().permitAll().build();
    StrictMode.setThreadPolicy(policy);
    String P_ID = patientID_editText.getText().toString();
    String msg = "Patient:" + P_ID + ", " + movementResult + ", Location:
" + stringLa + "," + stringLo;
    Socket socket;
    DataOutputStream dataOutputStream;
    DataInputStream dataInputStream;
    try {
        socket = new Socket("127.0.0.1", 5000);
        dataOutputStream = new
DataOutputStream(socket.getOutputStream());
        dataOutputStream.writeUTF(msg);
        dataInputStream = new DataInputStream(socket.getInputStream());
        textIn.setText(dataInputStream.readUTF());
        dataOutputStream.close();
        dataOutputStream.flush();
        socket.close();
    } catch (IOException e) {
        e.printStackTrace();
    }
}

void sentSMS() {
    String P_ID = patientID_editText.getText().toString();
    String phoneNumber = phone_Edittext.getText().toString();
    String sms_msg = "Patient:" + P_ID + ", " + movementResult + ",
Location: " + stringLa + "," + stringLo;
    try {
        smsManager = SmsManager.getDefault();
        smsManager.sendTextMessage(phoneNumber, null, sms_msg, null,
null);

        Log.i("Send SMS", "");
        Toast.makeText(getApplicationContext(), "SMS sent.",
Toast.LENGTH_LONG).show();
    } catch (Exception e) {
        Toast.makeText(getApplicationContext(), "SMS failed, please try
again.", Toast.LENGTH_LONG).show();
    }
}
}
}

```

## SQLiteDB.java

```

package com.example.savetosqlite;

import android.content.ContentValues;
import android.content.Context;
import android.database.Cursor;
import android.database.sqlite.SQLiteDatabase;
import android.database.sqlite.SQLiteOpenHelper;
import android.provider.ContactsContract;
import android.provider.SyncStateContract;
import android.util.Log;
import androidx.annotation.Nullable;
import java.text.SimpleDateFormat;

```

```

import java.util.ArrayList;
import java.util.Date;
import java.util.List;
public class SQLiteDB extends SQLiteOpenHelper {
    public static final String CREATE_TABLE = "create table " +
MyConstant.TABLE_NAME +
        "(" + MyConstant.COL_ID + " INTEGER, " + MyConstant.COL_X + "
REAL, " +
        MyConstant.COL_Y +
        " REAL, " + MyConstant.COL_Z + " REAL, " + MyConstant.COL_CLASS +
"
        varchar(10))";
    private SQLiteDatabase db;
    public SQLiteDB(@Nullable Context context) {
        super(context, MyConstant.DB_NAME, null, 1);
        db = this.getWritableDatabase();
    }
    @Override
    public void onCreate(SQLiteDatabase db) {
        Log.d("DatabaseHelper", "Create dataset");
        db.execSQL(CREATE_TABLE);
    }
    @Override
    public void onUpgrade(SQLiteDatabase db, int i, int i1) {
    }
    public long insertRecord(float x, float y, float z, String class_) {
        ContentValues values = new ContentValues();
        values.put(MyConstant.COL_X, x);
        values.put(MyConstant.COL_Y, y);
        values.put(MyConstant.COL_Z, z);
        values.put(MyConstant.COL_CLASS, class_);
        return db.insert(MyConstant.TABLE_NAME, null, values);
    }
    public List<DataBean> queryRecord() {
        Cursor cursor = db.rawQuery("SELECT * FROM " + MyConstant.TABLE_NAME,
null);
        List<DataBean> recordBeanList = new ArrayList<>();
        if (cursor.moveToFirst()) {
            do {
                // on below line we are adding the data from cursor to our
array list.
                recordBeanList.add(new
DataBean(Float.parseFloat(cursor.getString(1)),
                    Float.parseFloat(cursor.getString(2)),
                    Float.parseFloat(cursor.getString(3)),
                    cursor.getString(4)));
            } while (cursor.moveToNext());
            // moving our cursor to next.
        }
        cursor.close();
        return recordBeanList;
    }
}

```

Server.java

```
import java.net.*;
```

```

import java.io.*;
public class PoolEchoServer extends Thread {
    public final static int defaultPort = 5000;
    ServerSocket theServer;
    static int num_threads = 10;
    public static void main(String[] args) {
        int port = defaultPort;
        try { port = Integer.parseInt(args[0]); }
        catch (Exception e) { }
        if (port <= 0 || port >= 65536) port = defaultPort;
        try {
            ServerSocket ss = new ServerSocket(port);
            System.out.println("Server Socket Start!!");
            for (int i = 0; i < num_threads; i++) {
                System.out.println("Create num_threads "
                                   + i + " Port:" + port);
                PoolEchoServer pes = new PoolEchoServer(ss);
                pes.start();
            }
        }
        catch (IOException e) { System.err.println(e); }
    }
    public PoolEchoServer(ServerSocket ss) { theServer = ss; }

    public void run() {
        while (true) {
            try {
                DataOutputStream output;
                DataInputStream input;
                Socket connection = theServer.accept();
                System.out.println("Accept Client!");

                //OutputStream os = s.getOutputStream();
                //InputStream is = s.getInputStream();
                input = new DataInputStream(
                    connection.getInputStream() );
                output = new DataOutputStream(
                    connection.getOutputStream() );
                //BufferedReader bf = new
                //    BufferedReader(new InputStreamReader(is));

                System.out.println("Client Connected and Start get I/O!!");
                while (true) {
                    System.out.println("==> Input from Client: "
                                       + input.readUTF());

                    System.out.println(
                        "Output to Client ==> \"Connection successful\"");
                    output.writeUTF( "Connection successful" );
                }
            }
            catch (Exception e) { }
        }
    }
}

```

```
        //os.write(n);
        //os.write("Hello Client!!");
        output.flush();
    } // end while
} // end try
    catch (IOException e) { }
} // end while
} // end run
}
```