Phase 4: Development part – 2

PROJECT TITLE	**9238-IOT AIR QUALITY MONITERNING SYSTEM**
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TEAM NAME	**Proj_204185_team_2**
COLLEGE CODE-NAME	**9238 - MANGAYARKARASI COLLEGE OF ENGINEERING**
GROUP	**5**
GITHUB REPOSITORY LINK	https://github.com/jaisree2003/Ibm-NaanMudhalvan-iot.git

project Overview:

In this phase, we will continue building the project by developing a mobile app using Android Studio. The objective is to create an app that displays real-time parking availability data received from an ESP32 microcontroller, utilizing Firebase for data transmission and storage.

Prerequisites:

Android Studio installed. A Firebase account set up for the project. An ESP32 microcontroller programmed with Micro Python. A basic understanding of Python programming.

Step 1: Setting Up the Development Environment

1.1 Install Android Studio:

If not already installed, download and install Android Studio from the official

website: https://developer.android.com/studio.

1.2 Configure Android Studio:

Ensure you have the necessary SDKs and tools installed for Android app development.

1.3 Firebase Setup:

If not done already, create a Firebase project at

https://console.firebase.google.com/ and configure it for your Android app.

Step 2: Designing the App Interface

2.1 Implement the UI:

Use Android Studio's Layout Editor to create the app's user interface.

1. **Open Android Studio:**

Launch Android Studio and open your Android app project.

2. Navigate to XML Layout File: In the project explorer, navigate to the "res" folder, then "layout," and find the XML layout file where you want to design your user interface. Double-click the XML file to open it.

3.Open Layout Editor:

Once you've opened the XML layout file, you'll see two tabs at the bottom of the XML editor: "Text" and "Design." Click on the "Design" tab to open the Layout Editor.

4. Palette:

On the left side of the Layout Editor, you'll find the "Palette" panel. It contains various UI components such as buttons, text views, image views, and more. You can drag and drop these components onto the layout canvas to build your interface.

5. Component Tree:

On the right side of the Layout Editor, you'll find the "Component Tree" panel. It displays the hierarchy of UI components on your layout. You can select and manipulate components in this panel.

6. Attributes Panel:

Below the "Component Tree" panel, you'll find the "Attributes" panel. This panel allows you to customize the properties of selected UI components. You can change attributes like text, color, size, and positioning.

7. Layout Canvas:

The central area of the Layout Editor is the layout canvas. This is where you visually arrange and design your app's user interface. You can drag and drop components onto the canvas, adjust their positions, and see a real-time preview of how your layout will appear in the app.

8. Preview:

Above the layout canvas, there's a "Preview" panel that shows a livepreview of how your layout will look on different devices and orientations. You can switch between various screen sizes and orientations to ensure your layout is responsive.

9. Zoom and Pan:

You can zoom in and out of the layout canvas by using the zoom slider in the bottom right corner. You can also pan around the canvas to work on different parts of your layout.

10.Design Toolbar:

At the top of the Layout Editor, you'll find the design toolbar. It contains options for adding constraints, aligning components, and customizing the layout.

11.Adding Constraints:

Android Studio uses a constraint-based layout system (Constraint Layout) by default. To position UI components, you can add constraints that specify how they relate to other components or the parent layout. Constraints help your layout adapt to different screen sizes.

Layout program:

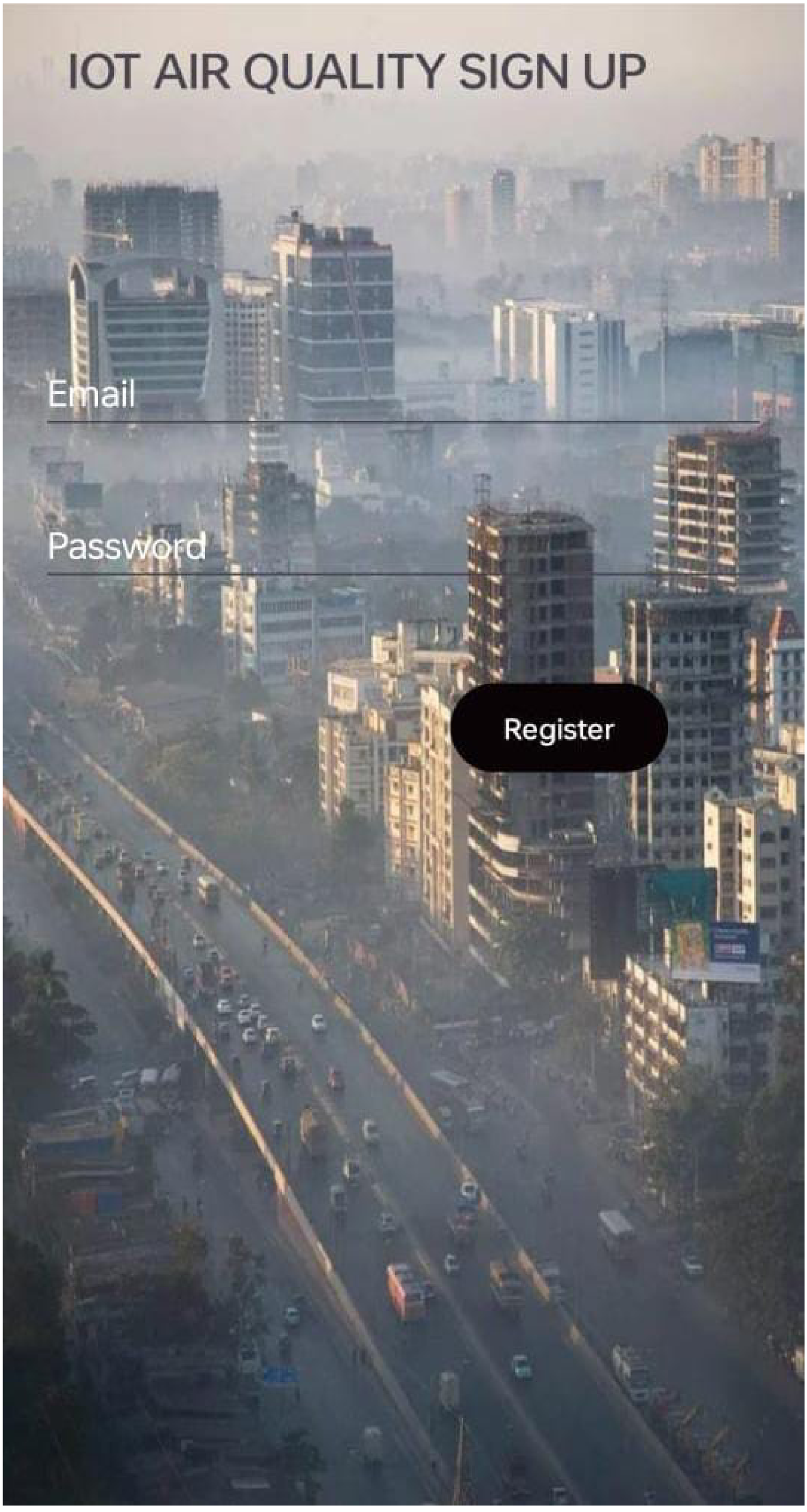
1.activity_login_html

```
<?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:background="@drawable/airr"
    android:padding="16dp"
    tools:ignore="ExtraText">


    <EditText
        android:id="@+id/emailEditText"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:hint="Email"
        android:inputType="textEmailAddress"
        android:textColor="#000000"
        android:textColorHint="#FFFFFF"
        app:layout_constraintBottom_toTopOf="@+id/passwordEditText"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.812"
        tools:layout_editor_absoluteX="16dp" />


    <EditText
        android:id="@+id/passwordEditText"
```

```
android:layout_width="match_parent"

android:layout_height="wrap_content"

android:layout_marginBottom="476dp"

android:hint="Password"

android:inputType="textPassword"

android:textColor="#F1EEEE"

android:textColorHighlight="#F8F5F5"

android:textColorHint="#F3F0F0"

app:layout_constraintBottom_toBottomOf="parent"

app:layout_constraintEnd_toEndOf="parent"

app:layout_constraintHorizontal_bias="0.125"

app:layout_constraintStart_toStartOf="parent" />


<Button

android:id="@+id/loginButton"

android:layout_width="95dp"

android:layout_height="49dp"

android:layout_marginEnd="64dp"

android:backgroundTint="#000000"

android:text="Login"

android:textColorHighlight="#CD7C7C"

app:layout_constraintBottom_toBottomOf="parent"

app:layout_constraintEnd_toEndOf="parent"

app:layout_constraintTop_toTopOf="parent"

app:layout_constraintVertical_bias="0.419"

app:rippleColor="#E14545"

app:strokeColor="#E85656" />


<Button

android:id="@+id/signup"

android:layout_width="101dp"
```

```
    android:layout_height="46dp"
    android:layout_marginEnd="24dp"
    android:backgroundTint="#000000"
    android:text="signup"
    android:textColorHighlight="#DC4040"
    android:textColorLink="#D84577"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toStartOf="@+id/loginButton"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.42" />

<TextView
    android:id="@+id/textView"
    android:layout_width="251dp"
    android:layout_height="36dp"
    android:layout_marginBottom="24dp"
    android:backgroundTint="#62C9D6"
    android:fontFamily="sans-serif-black"
    android:text="IOT Air Quality  Login"
    android:textAlignment="center"
    android:textAllCaps="true"
    android:textColor="#000000"
    android:textColorHighlight="#FAF9F9"
    android:textColorHint="#FFFFFF"
    android:textColorLink="#FBF9F9"
    android:textSize="20sp"
    android:textStyle="bold"
    app:layout_constraintBottom_toTopOf="@+id/emailEditText"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.506"
    app:layout_constraintStart_toStartOf="parent"
```

```
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.859" />

</androidx.constraintlayout.widget.ConstraintLayout>
```


IOT AIR QUALITY SIGN UP
Email
Password
Register

2. activity dashboard1.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:background="@drawable/airr"

    android:orientation="vertical"

    android:padding="16dp"

    tools:context=".Dashboard">


    <Button

        android:id="@+id/paymentButton"

        android:layout_width="326dp"

        android:layout_height="73dp"

        android:text="Quality of Air"

        app:layout_constraintBottom_toBottomOf="parent"

        app:layout_constraintEnd_toEndOf="parent"

        app:layout_constraintStart_toStartOf="parent"

        app:layout_constraintTop_toTopOf="parent"

        app:layout_constraintVertical_bias="0.515" />


    <Button

        android:id="@+id/settingsButton"

        android:layout_width="318dp"

        android:layout_height="110dp"

        android:text="Settings"

        app:layout_constraintBottom_toBottomOf="parent"

        app:layout_constraintEnd_toEndOf="parent"
```

```
    app:layout_constraintHorizontal_bias="0.526"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/paymentButton"
    app:layout_constraintVertical_bias="0.135" />

<Button
    android:id="@+id/myReservationsButton"
    android:layout_width="160dp"
    android:layout_height="72dp"
    android:layout_marginTop="36dp"
    android:text="Safety Methods"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.952"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/textView3"
    app:layout_constraintVertical_bias="0.146" />

<TextView
    android:id="@+id/textView3"
    android:layout_width="385dp"
    android:layout_height="73dp"
    android:padding="16dp"
    android:text="Air Quality Dashboard"
    android:textAlignment="center"
    android:textColor="#000000"
    android:textSize="24sp"
    app:layout_constraintBottom_toTopOf="@+id/paymentButton"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
```

```
    app:layout_constraintVertical_bias="0.0" />

<Button
    android:id="@+id/findParkingButton"
    android:layout_width="159dp"
    android:layout_height="73dp"
    android:layout_marginTop="36dp"
    android:text="Air Quality Index"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.007"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/textView3"
    app:layout_constraintVertical_bias="0.142" />

<ImageView
    android:id="@+id/imageView"
    android:layout_width="39dp"
    android:layout_height="69dp"
    android:layout_marginStart="4dp"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintStart_toStartOf="@+id/textView3"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.061"/>

<ImageView
    android:id="@+id/imageView2"
    android:layout_width="36dp"
    android:layout_height="61dp"
    android:layout_marginEnd="4dp"
```

```
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.065"/>



    <ImageView
        android:id="@+id/imageView3"
        android:layout_width="47dp"
        android:layout_height="58dp"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toStartOf="@+id/textView4"
        app:layout_constraintHorizontal_bias="1.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.182" />



    <TextView
        android:id="@+id/textView4"
        android:layout_width="294dp"
        android:layout_height="44dp"
        android:layout_marginStart="44dp"
        android:textAlignment="gravity"
        android:textAllCaps="true"
        android:textColor="#F6F3F3"
        android:textSize="12sp"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.078" />
```

```
<ImageView
    android:id="@+id/imageView4"
    android:layout_width="48dp"
    android:layout_height="47dp"
    android:src="@drawable/car"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="@+id/imageView2"
    app:layout_constraintHorizontal_bias="0.026"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.026" />

<ImageView
    android:id="@+id/imageView5"
    android:layout_width="50dp"
    android:layout_height="48dp"
    android:src="@drawable/car"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="1.0"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.023" />

<ImageView
    android:id="@+id/imageView6"
    android:layout_width="103dp"
    android:layout_height="64dp"
    android:src="@drawable/person"
    app:layout_constraintBottom_toBottomOf="parent"
```

```
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.019"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.166" />


    <androidx.constraintlayout.widget.Group
        android:id="@+id/group"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content" />



    <!– Add more buttons as needed –>


</androidx.constraintlayout.widget.ConstraintLayout>
```


Air Quality Dashboard
Air Quality Index
Safety Methods
Quality of Air
Settings

3.activity _Firebase

```
<?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:id="@+id/relativeLayout"

    android:layout_width="match_parent"

    android:layout_height="match_parent"

    android:background="#000C33"

    tools:context=".MainActivity">


    <!– Temperature Gauge View -->


    <!– Humidity Gauge View –>


    <!– Air Quality TextView –>


    <TextView

        android:id="@+id/airQualityTextView"

        android:layout_width="wrap_content"

        android:layout_height="wrap_content"

        android:fontFamily="sans-serif-black"

        android:text="Air Quality: Good"

        android:textColor="#FFFEFE"

        android:textSize="20sp"

        app:layout_constraintBottom_toBottomOf="parent"

        app:layout_constraintEnd_toEndOf="parent"

        app:layout_constraintHorizontal_bias="0.498"

        app:layout_constraintStart_toStartOf="parent"

        app:layout_constraintTop_toTopOf="parent"
```

```
    app:layout_constraintVertical_bias="0.784" />

<com.example.iotairqualitymonitoring.TemperatureGaugeView
    android:id="@+id/temperatureGaugeView"
    android:layout_width="399dp"
    android:layout_height="300dp"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.167" />

<com.example.iotairqualitymonitoring.HumidityGaugeView
    android:id="@+id/humidityGaugeView"
    android:layout_width="398dp"
    android:layout_height="294dp"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.538"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.684" />

<TextView
    android:id="@+id/airQualityTextView"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:fontFamily="sans-serif-black"
    android:text="Temperature"
    android:textAllCaps="true"
    android:textColor="#FFFEFE"
```

```
android:textSize="20sp"
app:layout_constraintBottom_toBottomOf="parent"
app:layout_constraintEnd_toEndOf="parent"
app:layout_constraintStart_toStartOf="parent"
app:layout_constraintTop_toTopOf="parent"
app:layout_constraintVertical_bias="0.343" />

<TextView
    android:id="@+id/airQualityTextView3"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:fontFamily="sans-serif-black"
    android:text="Iot Air Quality Monitoring"
    android:textAllCaps="true"
    android:textColor="#FFFEFE"
    android:textSize="20sp"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.495"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.022" />

<TextView
    android:id="@+id/airQualityTextView2"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:fontFamily="sans-serif-black"
    android:text="humidity"
    android:textAllCaps="true"
    android:textColor="#FFFEFE"
```

```
    android:textSize="20sp"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.661" /> <!-- Set the default text -->
android:textSize="18sp"
    android:textColor="#FFFFFF"
    app:layout_constraintTop_toBottomOf="@+id/humidityGaugeView"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintBottom_toBottomOf="parent" />

</androidx.constraintlayout.widget.ConstraintLayout>
```

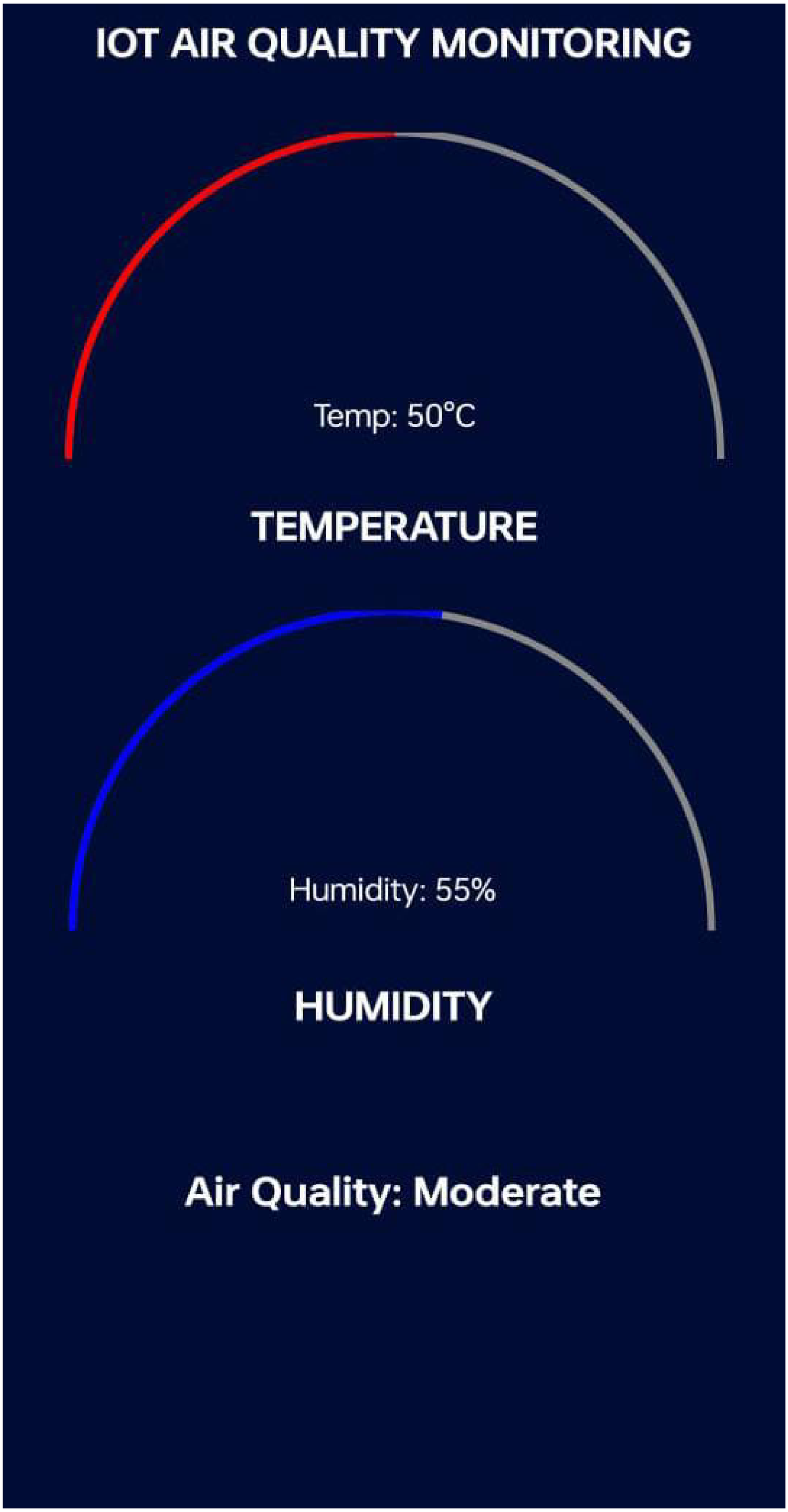
4.Firebase.java

```
package com.example.iotairqualitymonitoring;

import android.annotation.SuppressLint;
import android.os.Bundle;
import android.widget.TextView;
import android.widget.Toast;

import androidx.annotation.NonNull;
import androidx.appcompat.app.AppCompatActivity;

import com.google.firebase.database.DataSnapshot;
import com.google.firebase.database.DatabaseError;
import com.google.firebase.database.DatabaseReference;
import com.google.firebase.database.FirebaseDatabase;
import com.example.iotairqualitymonitoring.TemperatureGaugeView;
```

```
import com.example.iotairqualitymonitoring.HumidityGaugeView;
import com.google.firebase.database.ValueEventListener;

public class Firebase extends AppCompatActivity {

    private DatabaseReference sensorDataRef;

    private TemperatureGaugeView temperatureGauge;
    private HumidityGaugeView humidityGauge;

    private TextView airQualityTextView;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_firebase);

// Initialize Firebase
FirebaseDatabase firebaseDatabase = FirebaseDatabase.getInstance();
sensorDataRef = firebaseDatabase.getReference("air_quality");

// Get references to GaugeView widgets in your layout
humidityGauge=findViewById(R.id.humidityGaugeView);
temperatureGauge=findViewById(R.id.temperatureGaugeView);
airQualityTextView=findViewById(R.id.airQualityTextView);

sensorDataRef.addValueEventListener(new ValueEventListener() {
```

```
@SuppressLint("SetTextI18n")
@Override
public void onDataChange(@NonNull DataSnapshot dataSnapshot) {
    if (dataSnapshot.exists()) {
        // Retrieve values from the dataSnapshot
        Integer temp = dataSnapshot.child("Temperature").getValue(Integer.class);
        Integer hum = dataSnapshot.child("Humidity").getValue(Integer.class);
        String status = dataSnapshot.child("AirQuality").getValue(String.class);

        // Check if the values are not null before using them
        if (temp != null) {
            // Now you can safely use the temperature value
            // Update your TemperatureGaugeView or TextView with 'temp'
            temperatureGauge.setTemperature(temp);
            Toast.makeText(Firebase.this, "Temp present"+temp, Toast.LENGTH_SHORT).show();
        } else {
            // Handle the case where "Temperature" is null or not an Integer
            Toast.makeText(Firebase.this, "Temp null", Toast.LENGTH_SHORT).show();
        }

        if (hum != null) {
            // Now you can safely use the humidity value
            // Update your HumidityGaugeView or TextView with 'hum'
            humidityGauge.setHumidity(hum);
            Toast.makeText(Firebase.this, "hum"+hum, Toast.LENGTH_SHORT).show();
        } else {
            // Handle the case where "Humidity" is null or not an Integer
            Toast.makeText(Firebase.this, "hum null", Toast.LENGTH_SHORT).show();
        }

        if (status != null) {
```

```
            // Now you can safely use the air quality status
            // Update your TextView with 'status'
            airQualityTextView.setText("Air Quality:" + " " +status);
            Toast.makeText(Firebase.this, "status"+status, Toast.LENGTH_SHORT).show();
        } else {
            // Handle the case where "AirQuality" is null or not a String
            Toast.makeText(Firebase.this, "Status null", Toast.LENGTH_SHORT).show();
        }


    }
    else
    {
        Toast.makeText(Firebase.this, "data not found", Toast.LENGTH_SHORT).show();
    }
}


        @Override
        public void onCancelled(@NonNull DatabaseError databaseError) {
            // Handle database error
        }
    });


    }
}
```


IOT AIR QUALITY MONITORING
Temp: 50°C
TEMPERATURE
Humidity: 55%
HUMIDITY
Air Quality: Moderate

1. Class Name:

The class is named iotairquality monitoring.

2. Class Purpose:

This class likely represents the quality of a air. It appears to be designed for use in the context of the "Quality Of air" application, possibly for tracking the quality if air in a particular area.

3. Class Fields:

private String Status: This field represents the status of the air. It is a string that can hold various values such as ," good", "moderate", "bad".

4. Constructor:

This constructor is often necessary when working with Firebase or other data storage systems that require default constructors for deserialization.

5. Getter Methods:

The class provides getter methods for accessing the values of its fields. These methods allow other parts of the code to retrieve the status and air quality information.

Conclusion:

The application provides a clear and concise set of steps for users to follow in order to access and use its features. Users are guided through the process of logging into their Firebase account or creating one if they don't already have one. Once logged in, they can easily check the quality of air by clicking the designated button. The application ensures a straightforward user experience for knowing about air quality and monitoring their status.