Creating a Fully Functional TicTacToe Game Application for Android Smartphones

In June 2023, I developed a mobile application named TicTacToe. This project was designed specifically for Android smartphones and is a two-player game. The development of this application was an interesting and rewarding experience, taking an entire month to complete. This document will provide a detailed guide on how a normal person can create a fully functional TicTacToe game application. The steps are organized in a professional manner to ensure clarity and ease of understanding.

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1. Introduction

Creating a mobile application can be a rewarding experience. This guide will walk you through the process of developing a TicTacToe game for Android smartphones. By following these steps, you will gain an understanding of the development process and acquire the skills needed to create your own applications.

2. Requirements

Before starting, ensure you have the following:

- A computer with internet access

- Android Studio installed
- Basic knowledge of Java and XML
- An Android device or emulator for testing

3. Setting Up the Development Environment

Step 1: Open Android Studio

- Launch Android Studio on your computer.

Step 2: Create a New Project

- Navigate to **Files > New > New Project** and select **Empty View Activity**.
- Name your project "TicTacToe" and hit enter. This will be a Java-based project.

Step 3: Create Necessary Files

- Under `com.example.Java > Java`, create the following files:
  - `AddPlayer.java`
  - `MainActivity.java`
  - `ResultDialogBox.java`
- Under `res > layouts`, create the following XML layout files:
  - `activity_add_player.xml`
  - `activity_main.xml`
  - `activity_result_dialog_box.xml`

4. Designing the User Interface

Step 4: Add Images

- Paste the necessary images into the res > drawable folder in .png format.
- Ensure to include a background image for the Add Players screen in the same folder.
-
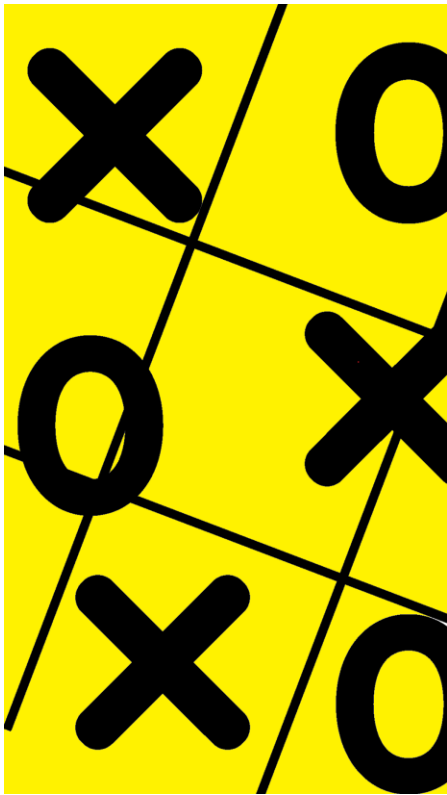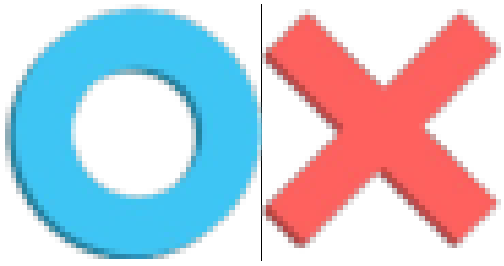
5. Implementing the Game Logic

Here will be the program for MainActivity.Java

```java
package com.example.tictactoe;

import androidx.appcompat.app.AppCompatActivity;

import android.os.Bundle;
import android.view.View;
import android.widget.ImageView;

import com.example.tictactoe.databinding.ActivityMainBinding;

import java.util.ArrayList;
import java.util.List;

public class MainActivity extends AppCompatActivity {

    ActivityMainBinding binding;
    private final List<int[]> combinationList = new ArrayList<>();
    private int[] boxPositions = {0,0,0,0,0,0,0,0,0}; //9 zero
    private int playerTurn = 1;
    private int totalSelectedBoxes = 1;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        binding = ActivityMainBinding.inflate(getLayoutInflater());
        setContentView(binding.getRoot());

        combinationList.add(new int[] {0,1,2});
        combinationList.add(new int[] {3,4,5});
        combinationList.add(new int[] {6,7,8});
        combinationList.add(new int[] {0,3,6});
        combinationList.add(new int[] {1,4,7});
        combinationList.add(new int[] {2,5,8});
        combinationList.add(new int[] {2,4,6});
        combinationList.add(new int[] {0,4,8});

        String getPlayerOneName = getIntent().getStringExtra("playerOne");
        String getPlayerTwoName = getIntent().getStringExtra("playerTwo");

        binding.playerOneName.setText(getPlayerOneName);
        binding.playerTwoName.setText(getPlayerTwoName);

        binding.image1.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                if (isBoxSelectable(0)){
                    performAction((ImageView) view, 0);
                }
            }
        });

        binding.image2.setOnClickListener(new View.OnClickListener() {
            @Override
```

```java
            public void onClick(View view) {
                if (isBoxSelectable(1)){
                    performAction((ImageView) view, 1);
                }
            }
        });
        binding.image3.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                if (isBoxSelectable(2)){
                    performAction((ImageView) view, 2);
                }
            }
        });
        binding.image4.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                if (isBoxSelectable(3)){
                    performAction((ImageView) view, 3);
                }
            }
        });
        binding.image5.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                if (isBoxSelectable(4)){
                    performAction((ImageView) view, 4);
                }
            }
        });
        binding.image6.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                if (isBoxSelectable(5)){
                    performAction((ImageView) view, 5);
                }
            }
        });
        binding.image7.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                if (isBoxSelectable(6)){
                    performAction((ImageView) view, 6);
                }
            }
        });
        binding.image8.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                if (isBoxSelectable(7)){
                    performAction((ImageView) view, 7);
                }
            }
        });
        binding.image9.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                if (isBoxSelectable(8)){
                    performAction((ImageView) view, 8);
                }
            }
```

```java
            });

    }

    private void performAction(ImageView  imageView, int
selectedBoxPosition) {
        boxPositions[selectedBoxPosition] = playerTurn;

        if (playerTurn == 1) {
            imageView.setImageResource(R.drawable.ximage);
            if (checkResults()) {
                ResultDialog resultDialog = new
ResultDialog(MainActivity.this, binding.playerOneName.getText().toString()
                        + " is a Winner!", MainActivity.this);
                resultDialog.setCancelable(false);
                resultDialog.show();
            } else if(totalSelectedBoxes == 9) {
                ResultDialog resultDialog = new
ResultDialog(MainActivity.this, "Match Draw", MainActivity.this);
                resultDialog.setCancelable(false);
                resultDialog.show();
            } else {
                changePlayerTurn(2);
                totalSelectedBoxes++;
            }
        } else {
            imageView.setImageResource(R.drawable.oimage);
            if (checkResults()) {
                ResultDialog resultDialog = new
ResultDialog(MainActivity.this, binding.playerTwoName.getText().toString()
                        + " is a Winner!", MainActivity.this);
                resultDialog.setCancelable(false);
                resultDialog.show();
            } else if(totalSelectedBoxes == 9) {
                ResultDialog resultDialog = new
ResultDialog(MainActivity.this, "Match Draw", MainActivity.this);
                resultDialog.setCancelable(false);
                resultDialog.show();
            } else {
                changePlayerTurn(1);
                totalSelectedBoxes++;
            }
        }
    }

    private void changePlayerTurn(int currentPlayerTurn) {
        playerTurn = currentPlayerTurn;
        if (playerTurn == 1) {

binding.playerOneLayout.setBackgroundResource(R.drawable.black_border);

binding.playerTwoLayout.setBackgroundResource(R.drawable.white_box);
        } else {

binding.playerTwoLayout.setBackgroundResource(R.drawable.black_border);

binding.playerOneLayout.setBackgroundResource(R.drawable.white_box);
        }
    }

    private boolean checkResults(){
```

```java
        boolean response = false;
        for (int i = 0; i < combinationList.size(); i++){
            final int[] combination = combinationList.get(i);

            if (boxPositions[combination[0]] == playerTurn &&
boxPositions[combination[1]] == playerTurn &&
                    boxPositions[combination[2]] == playerTurn) {
                response = true;
            }
        }
        return response;
    }

    private boolean isBoxSelectable(int boxPosition) {
        boolean response = false;
        if (boxPositions[boxPosition] == 0) {
            response = true;
        }
        return response;
    }

    public void restartMatch(){
        boxPositions = new int[] {0,0,0,0,0,0,0,0,0}; //9 zero
        playerTurn = 1;
        totalSelectedBoxes = 1;

        binding.image1.setImageResource(R.drawable.white_box);
        binding.image2.setImageResource(R.drawable.white_box);
        binding.image3.setImageResource(R.drawable.white_box);
        binding.image4.setImageResource(R.drawable.white_box);
        binding.image5.setImageResource(R.drawable.white_box);
        binding.image6.setImageResource(R.drawable.white_box);
        binding.image7.setImageResource(R.drawable.white_box);
        binding.image8.setImageResource(R.drawable.white_box);
        binding.image9.setImageResource(R.drawable.white_box);
    }
}
```

activity_main.xml

```xml
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout
    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="#FFFB00"
    tools:context=".MainActivity">


    <LinearLayout
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:gravity="center"
        android:layout_above="@id/container"
```

```xml
        android:layout_alignParentTop="true"
        android:orientation="horizontal">

    <LinearLayout
        android:layout_width="120dp"
        android:layout_height="wrap_content"
        android:id="@+id/playerOneLayout"
        android:orientation="vertical"
        android:gravity="center"
        android:background="@drawable/white_box"
        android:backgroundTint="@color/yellow_Light">


        <TextView
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:layout_marginTop="20dp"
            android:text="Player One"
            android:id="@+id/playerOneName"
            android:textSize="20sp"
            android:gravity="center"
            android:textStyle="bold"
            android:textColor="@color/black"
            android:maxLines="1"/>

        <ImageView
            android:layout_width="40dp"
            android:layout_height="40dp"
            android:src="@drawable/ximage"
            android:layout_marginTop="20dp"
            android:layout_marginBottom="20dp"
            android:layout_gravity="center"/>

    </LinearLayout>

    <LinearLayout
        android:layout_width="120dp"
        android:layout_height="wrap_content"
        android:layout_marginStart="10dp"
        android:id="@+id/playerTwoLayout"
        android:orientation="vertical"
        android:gravity="center"
        android:background="@drawable/white_box"
        android:backgroundTint="@color/yellow_Light">

        <TextView
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:layout_marginTop="20dp"
            android:text="Player Two"
            android:id="@+id/playerTwoName"
            android:textSize="20sp"
            android:gravity="center"
            android:textStyle="bold"
            android:textColor="@color/black"
            android:maxLines="1"/>

        <ImageView
            android:layout_width="40dp"
            android:layout_height="40dp"
            android:src="@drawable/oimage"
```

```xml
                android:layout_marginTop="20dp"
                android:layout_marginBottom="20dp"
                android:layout_gravity="center"/>

        </LinearLayout>

    </LinearLayout>

    <LinearLayout
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:id="@+id/container"
        android:layout_alignParentBottom="true"
        android:layout_marginStart="10dp"
        android:layout_marginEnd="10dp"
        android:layout_marginBottom="50dp"
        android:orientation="vertical">

        <LinearLayout
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:orientation="horizontal"
            android:weightSum="3">

            <ImageView
                android:layout_width="0dp"
                android:layout_height="115dp"
                android:id="@+id/image1"
                android:layout_weight="1"
                android:background="@drawable/white_box"
                android:backgroundTint="@color/yellow_Light"
                android:layout_marginTop="10dp"
                android:layout_marginEnd="5dp"
                android:layout_marginStart="10dp"
                android:adjustViewBounds="true"
                android:padding="20dp"/>

            <ImageView
                android:layout_width="0dp"
                android:layout_height="115dp"
                android:id="@+id/image2"
                android:layout_weight="1"
                android:background="@drawable/white_box"
                android:backgroundTint="@color/yellow_Light"
                android:layout_marginTop="10dp"
                android:layout_marginEnd="5dp"
                android:layout_marginStart="10dp"
                android:adjustViewBounds="true"
                android:padding="20dp"/>

            <ImageView
                android:layout_width="0dp"
                android:layout_height="115dp"
                android:id="@+id/image3"
                android:layout_weight="1"
                android:background="@drawable/white_box"
                android:backgroundTint="@color/yellow_Light"
                android:layout_marginTop="10dp"
                android:layout_marginEnd="5dp"
                android:layout_marginStart="10dp"
                android:adjustViewBounds="true"
```

```xml
            android:padding="20dp"/>


    </LinearLayout>

    <LinearLayout
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:orientation="horizontal"
        android:weightSum="3">

        <ImageView
            android:layout_width="0dp"
            android:layout_height="115dp"
            android:id="@+id/image4"
            android:layout_weight="1"
            android:background="@drawable/white_box"
            android:backgroundTint="@color/yellow_Light"
            android:layout_marginTop="10dp"
            android:layout_marginEnd="5dp"
            android:layout_marginStart="10dp"
            android:adjustViewBounds="true"
            android:padding="20dp"/>

        <ImageView
            android:layout_width="0dp"
            android:layout_height="115dp"
            android:id="@+id/image5"
            android:layout_weight="1"
            android:background="@drawable/white_box"
            android:backgroundTint="@color/yellow_Light"
            android:layout_marginTop="10dp"
            android:layout_marginEnd="5dp"
            android:layout_marginStart="10dp"
            android:adjustViewBounds="true"
            android:padding="20dp"/>

        <ImageView
            android:layout_width="0dp"
            android:layout_height="115dp"
            android:id="@+id/image6"
            android:layout_weight="1"
            android:background="@drawable/white_box"
            android:backgroundTint="@color/yellow_Light"
            android:layout_marginTop="10dp"
            android:layout_marginEnd="5dp"
            android:layout_marginStart="10dp"
            android:adjustViewBounds="true"
            android:padding="20dp"/>


    </LinearLayout>

    <LinearLayout
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:orientation="horizontal"
        android:weightSum="3">

        <ImageView
            android:layout_width="0dp"
```

```xml
                android:layout_height="115dp"
                android:id="@+id/image7"
                android:layout_weight="1"
                android:background="@drawable/white_box"
                android:backgroundTint="@color/yellow_Light"
                android:layout_marginTop="10dp"
                android:layout_marginEnd="5dp"
                android:layout_marginStart="10dp"
                android:adjustViewBounds="true"
                android:padding="20dp"/>

            <ImageView
                android:layout_width="0dp"
                android:layout_height="115dp"
                android:id="@+id/image8"
                android:layout_weight="1"
                android:adjustViewBounds="true"
                android:background="@drawable/white_box"
                android:backgroundTint="@color/yellow_Light"
                android:layout_marginTop="10dp"
                android:layout_marginEnd="5dp"
                android:layout_marginStart="10dp"
                android:padding="20dp"/>

            <ImageView
                android:layout_width="0dp"
                android:layout_height="115dp"
                android:id="@+id/image9"
                android:layout_weight="1"
                android:background="@drawable/white_box"
                android:backgroundTint="@color/yellow_Light"
                android:layout_marginTop="10dp"
                android:layout_marginEnd="5dp"
                android:layout_marginStart="10dp"
                android:padding="20dp"
                android:adjustViewBounds="true"/>

        </LinearLayout>

    </LinearLayout>

</RelativeLayout>
```
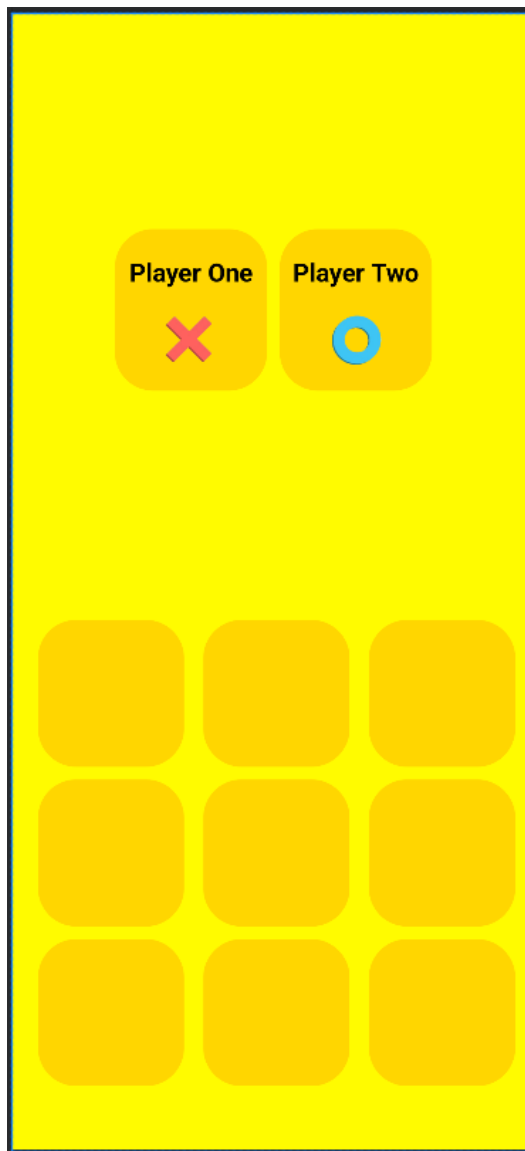
Output Main Activity

Program for AddPlayer.Java

```java
package com.example.tictactoe;

import androidx.appcompat.app.AppCompatActivity;

import android.content.Intent;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.Toast;

public class AddPlayers extends AppCompatActivity {

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

```java
        EditText playerOne = findViewById(R.id.playerOne);
        EditText playerTwo = findViewById(R.id.playerTwo);
        Button startGameButton = findViewById(R.id.startGameButton);

        startGameButton.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {

                String getPlayerOneName = playerOne.getText().toString();
                String getPlayerTwoName = playerTwo.getText().toString();

                if (getPlayerOneName.isEmpty() ||
getPlayerTwoName.isEmpty()) {
                    Toast.makeText(AddPlayers.this, "Please enter player
name", Toast.LENGTH_SHORT).show();
                } else {
                    Intent intent = new Intent(AddPlayers.this,
MainActivity.class);
                    intent.putExtra("playerOne", getPlayerOneName);
                    intent.putExtra("playerTwo", getPlayerTwoName);
                    startActivity(intent);
                }
            }
        });

    }
}
```

activity_add_player.xml

```xml
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout
    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:orientation="vertical"
    android:gravity="center"
    android:background="@drawable/back_ground"
    tools:context=".AddPlayers">
<androidx.cardview.widget.CardView
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:layout_margin="30dp"
    app:cardCornerRadius="30dp"
    app:cardElevation="20dp">

    <LinearLayout
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:orientation="vertical"
        android:layout_gravity="center_horizontal"
        android:padding="24dp"
        android:background="@color/yellow_Light">

        <TextView
            android:layout_width="match_parent"
```

```xml
            android:layout_height="wrap_content"
            android:text="ENTER \n PLAYERS NAMES"
            android:textAlignment="center"
            android:textSize="36sp"
            android:textStyle="bold"
            android:textColor="@color/black"/>

        <EditText
            android:layout_width="match_parent"
            android:layout_height="50dp"
            android:id="@+id/playerOne"
            android:background="@color/yellow_Light"
            android:layout_marginTop="40dp"
            android:padding="8dp"
            android:maxLines="1"
            android:textStyle="italic"
            android:hint="Enter player one name"
            android:textColorHint="@color/black"
            android:textColor="@color/black"
            android:drawableLeft="@drawable/ic_xicon"
            android:drawablePadding="8dp"/>

        <EditText
            android:layout_width="match_parent"
            android:layout_height="50dp"
            android:id="@+id/playerTwo"
            android:background="@color/yellow_Light"
            android:layout_marginTop="20dp"
            android:padding="8dp"
            android:maxLines="1"
            android:textStyle="italic"
            android:hint="Enter player two name"
            android:textColorHint="@color/black"
            android:textColor="@color/black"
            android:drawableLeft="@drawable/ic_oicon"
            android:drawablePadding="8dp"/>

        <Button
            android:layout_width="match_parent"
            android:layout_height="60dp"
            android:layout_marginTop="30dp"
            android:id="@+id/startGameButton"
            android:text="Start Game"
            android:textSize="18sp"
            android:textColor="@color/black"
            app:cornerRadius = "20dp"/>

    </LinearLayout>

</androidx.cardview.widget.CardView>


</RelativeLayout>
```
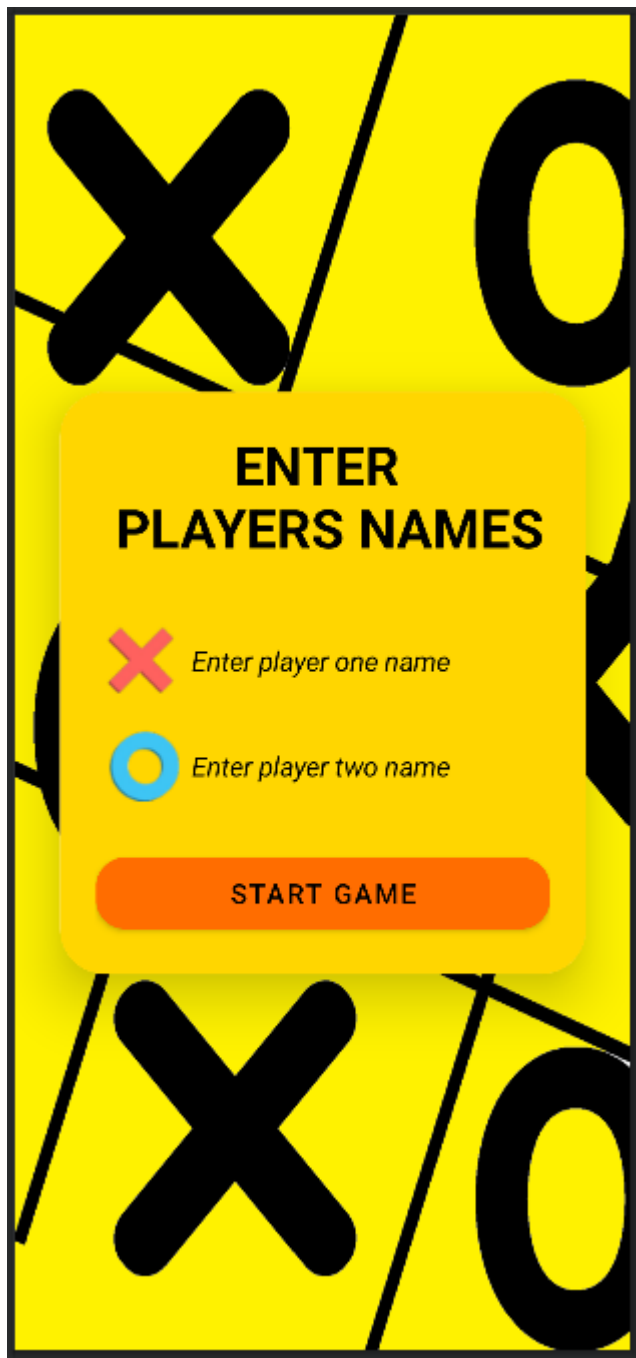
Output:

Program of ResultDailog.java

```java
package com.example.tictactoe;

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

import android.app.Dialog;
import android.content.Context;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;
```

```java
import android.widget.TextView;

public class ResultDialog extends Dialog {

    private final String message;
    private final MainActivity mainActivity;

    public ResultDialog(@NonNull Context context, String message,
MainActivity mainActivity) {
        super(context);
        this.message = message;
        this.mainActivity = mainActivity;
    }

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

        TextView messageText = findViewById(R.id.messageText);
        Button startAgainButton = findViewById(R.id.startAgainButton);

        messageText.setText(message);

        startAgainButton.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                mainActivity.restartMatch();
                dismiss();
            }
        });
    }
}
```

activity_result_dailog.xml

```xml
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout
    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"
    tools:context=".ResultDialog">

    <LinearLayout
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:background="@color/yellow_Light"
        android:orientation="vertical">

        <TextView
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:id="@+id/messageText"
            android:gravity="center"
            android:text="Results"
            android:textColor="@color/black"
            android:layout_marginTop="20dp"
```

```
                android:layout_marginStart="20dp"
                android:layout_marginEnd="20dp"
                android:textSize="18sp"
                android:textStyle="bold"/>

        <Button
                android:layout_width="match_parent"
                android:layout_height="60dp"
                android:id="@+id/startAgainButton"
                android:textSize="18sp"
                android:textStyle="bold"
                android:backgroundTint="@color/Orange"
                android:text="Start Again"
                android:layout_margin="20dp"
                android:textColor="@color/black"
                app:cornerRadius = "20dp"/>

    </LinearLayout>

</RelativeLayout>
```
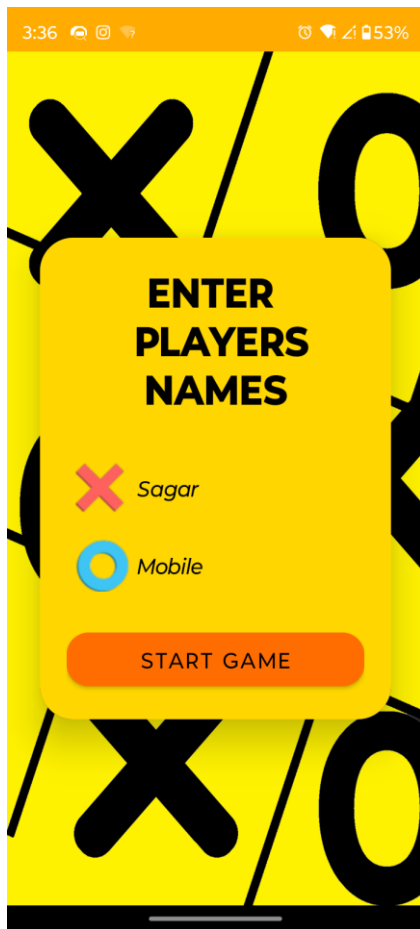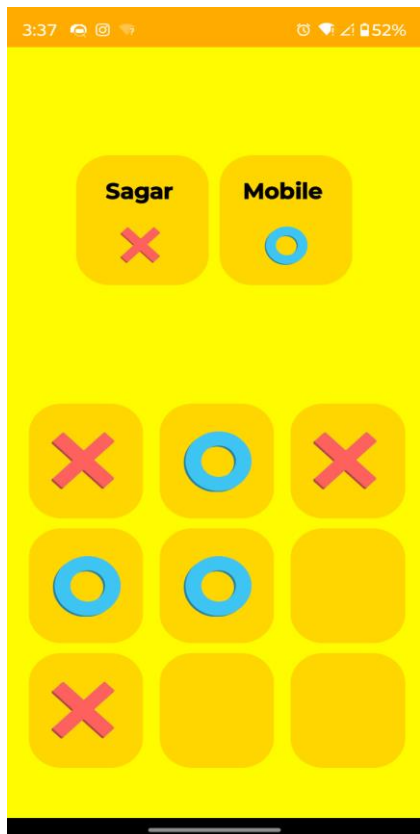
Output:

6. Testing and Debugging
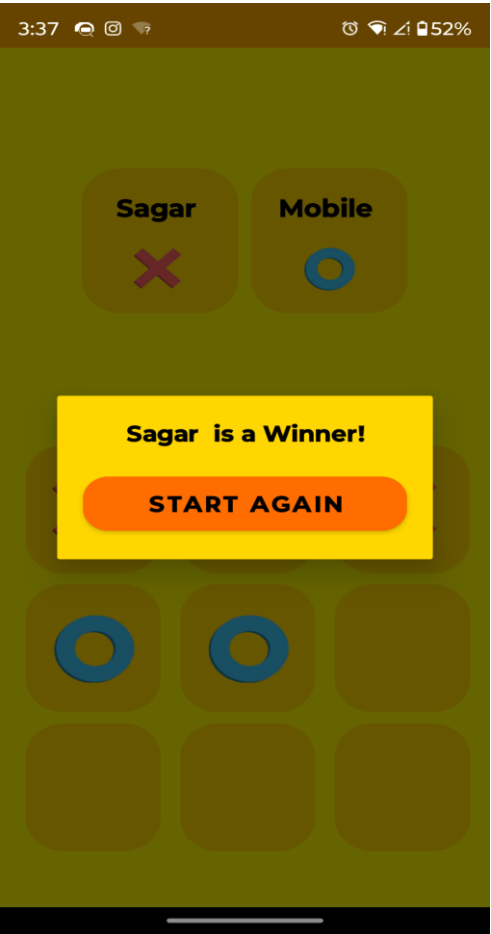
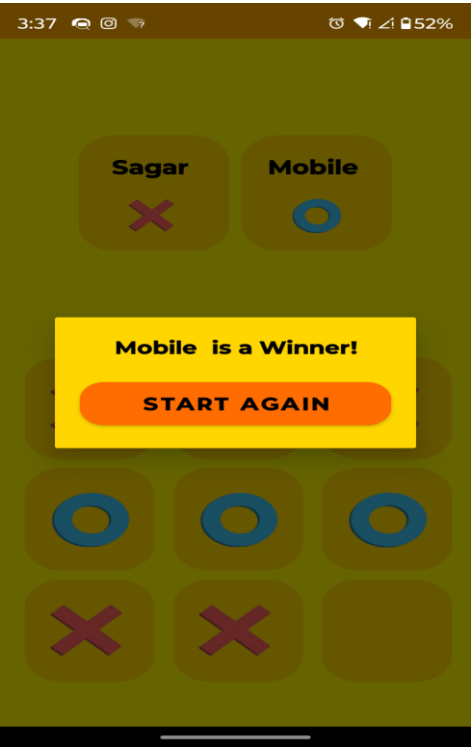Now we will run this application on our smartphone

First Page :

Second Page

Player 1 Winner:

Second Player Winner:

7. Conclusion

Developing a TicTacToe game for Android smartphones is an excellent way to enhance your programming skills and gain experience in mobile application development. By following this guide, you can create a fully functional and enjoyable game. Happy coding!