CSE 162 Mobile Computing

Face Detection

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Goal

Familiarize with the Android ML Kit

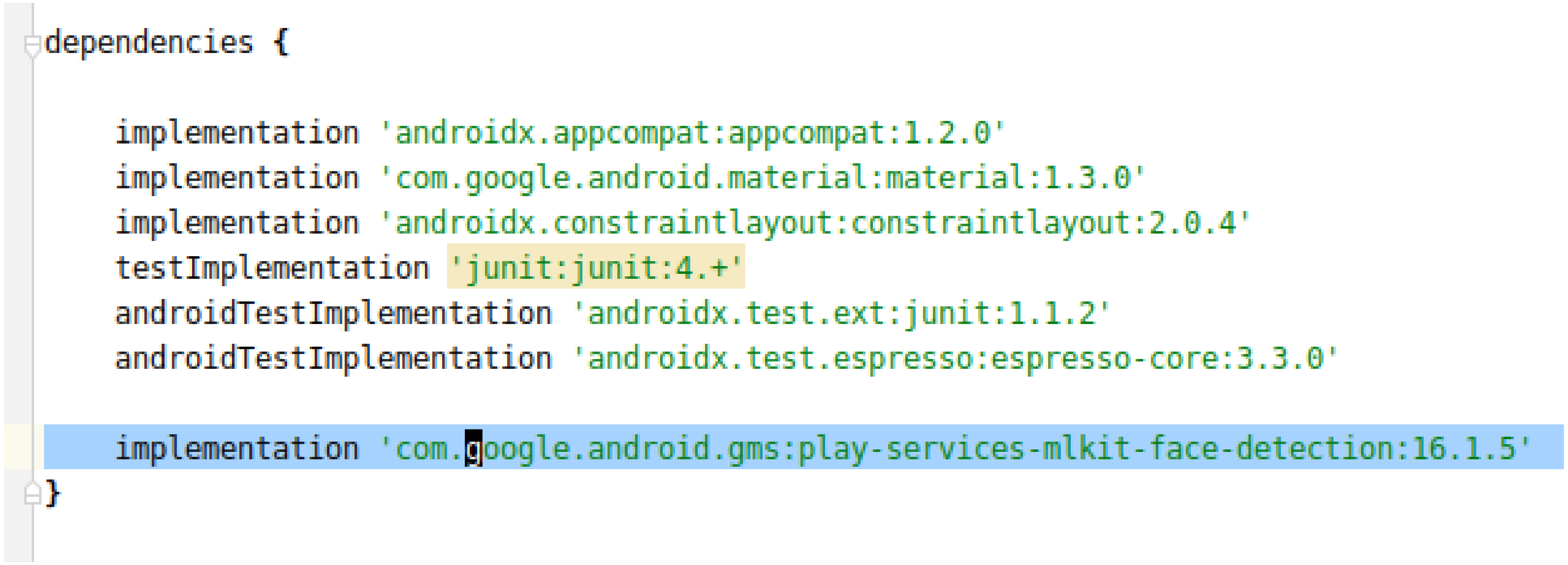
Detect face in images

Feature

- Display an image
- Use ML Kit to find the face
- Highlight the face in the image

Setup the dependency

- In the app/build.gradle
- implementation 'com.google.android.gms:play-services-mlkit-face-detection:16.1.5'



```
dependencies {

    implementation 'androidx.appcompat:appcompat:1.2.0'
    implementation 'com.google.android.material:material:1.3.0'
    implementation 'androidx.constraintlayout:constraintlayout:2.0.4'
    testImplementation 'junit:junit:4.+'
    androidTestImplementation 'androidx.test.ext:junit:1.1.2'
    androidTestImplementation 'androidx.test.espresso:espresso-core:3.3.0'

    implementation 'com.google.android.gms:play-services-mlkit-face-detection:16.1.5'
}
```

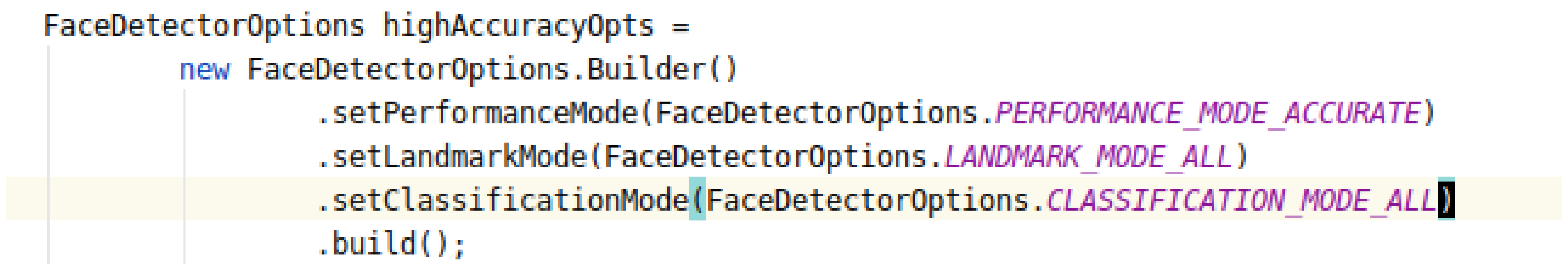
In the manifest.xml

- configure the app to automatically download the model to the device after theapp is installed

```
<application ...>
...
  <meta-data
     android:name="com.google.mlkit.vision.DEPENDENCIES"
     android:value="face" />
  <!-- To use multiple models: android:value="face,model2,model3" -->
  </application>
```

Prepare for the image detection

- In MainActivity.java onCreate()
- configure the detection options

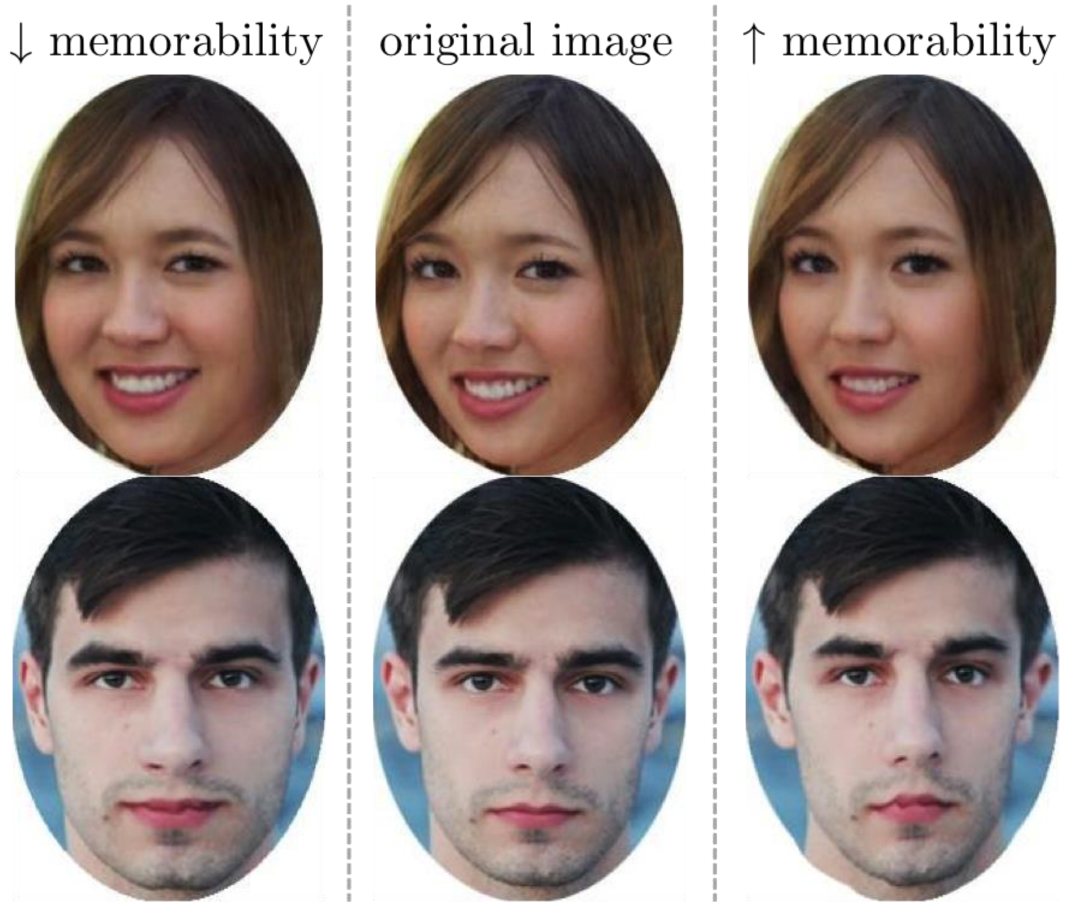


```
FaceDetectorOptions highAccuracyOpts =
        new FaceDetectorOptions.Builder()
                .setPerformanceMode(FaceDetectorOptions.PERFORMANCE_MODE_ACCURATE)
                .setLandmarkMode(FaceDetectorOptions.LANDMARK_MODE_ALL)
                .setClassificationMode(FaceDetectorOptions.CLASSIFICATION_MODE_ALL)
                .build();
```

Prepare the image for processing

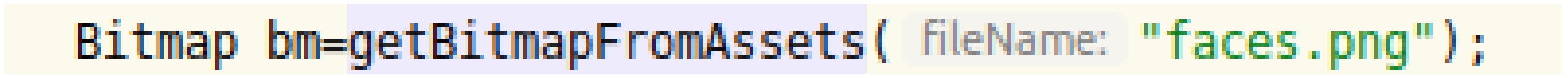
- place the image file into the path: FaceDetector/app/src/main/assets/
- create the folder if needed.
- The app has access to the files in this folder.

sample image

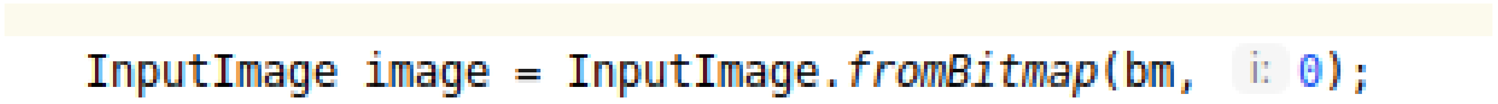


In MainActivity.java

- read the image
- Convert the image to the appropriate format using InputImage object



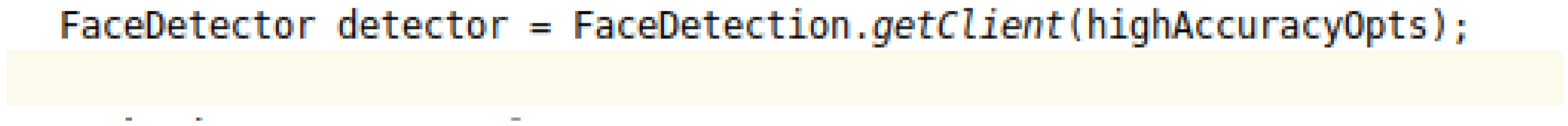
```
Bitmap bm=getBitmapFromAssets( fileName: "faces.png");
```



```
InputImage image = InputImage.fromBitmap(bm, i: 0);
```

```
private Bitmap getBitmapFromAssets(String fileName){

    AssetManager am = getAssets();
    InputStream is = null;
    try{

        is = am.open(fileName);
    }catch(IOException e){
        e.printStackTrace();
    }
    Bitmap bitmap = BitmapFactory.decodeStream(is);
    return bitmap;
}
```

Get an instance of FaceDetector



```
FaceDetector detector = FaceDetection.getClient(highAccuracyOpts);
```

Process the image

```
Task<List<Face>> result =
        detector.process(image)
                .addOnSuccessListener(
                        new OnSuccessListener<List<Face>>() {
                            @Override
                            public void onSuccess(List<Face> faces) {
                                // Task completed successfully
                                // ...
                            }
                        })
                .addOnFailureListener(
                        new OnFailureListener() {
                            @Override
                            public void onFailure(@NonNull Exception e) {
                                // Task failed with an exception
                                // ...
                            }
                        });
```

Get the detection result

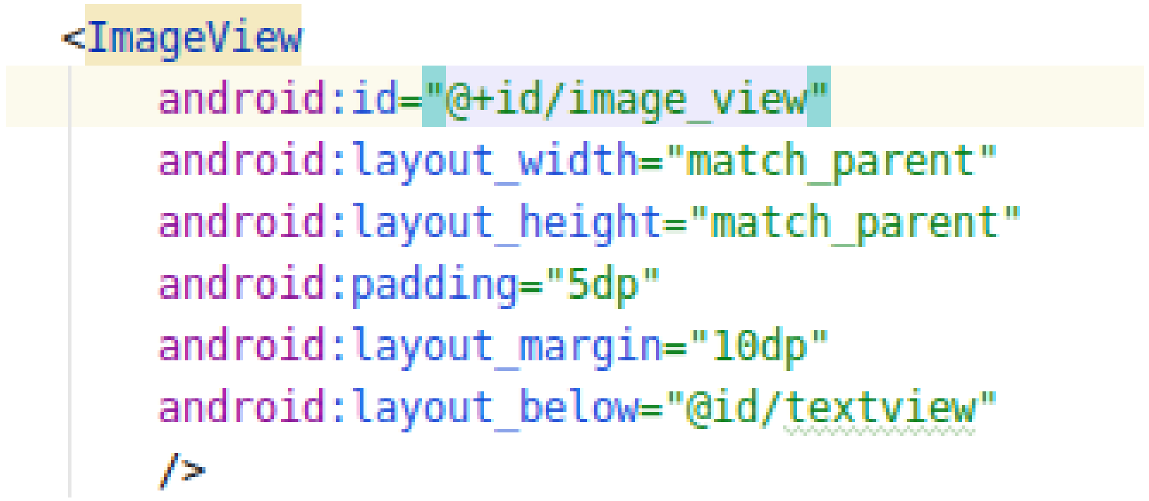
- If the face detection operation succeeds, a list of Face objects are passed to the success listener.
- Each Face object represents a face that was detected in the image.
- For each face, you can get its bounding coordinates in the input image, as well as any other information you configured the face detector to find.
- In this lab, we want to plot a rectangle for each face.

Many facial features can be detected. We focus on foundingbox of the face

```
Rect bounds = face.getBoundingBox();
float rotY = face.getHeadEulerAngleY();  // Head is rotated to the right rotY degrees
float rotZ = face.getHeadEulerAngleZ();  // Head is tilted sideways rotZ degrees
// If landmark detection was enabled (mouth, ears, eyes, cheeks, and
// nose available):
FaceLandmark leftEar = face.getLandmark(FaceLandmark.LEFT_EAR);
if (leftEar != null) {
    PointF leftEarPos = leftEar.getPosition();
}
// If contour detection was enabled:
List<PointF> leftEyeContour =
        face.getContour(FaceContour.LEFT_EYE).getPoints();
List<PointF> upperLipBottomContour =
        face.getContour(FaceContour.UPPER_LIP_BOTTOM).getPoints();
```

Display the results

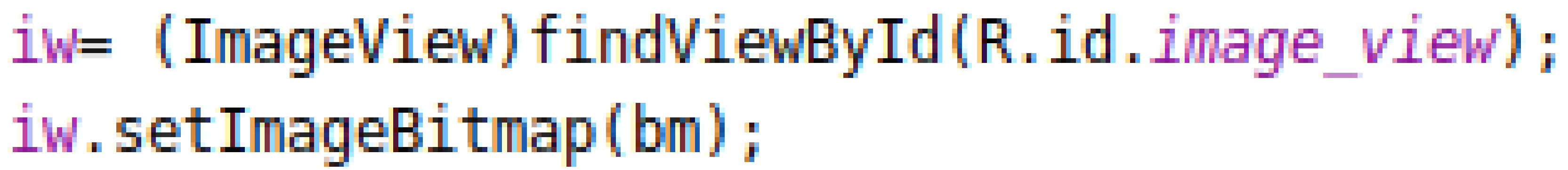
- In activity_main.xml, add imageview



```xml
<ImageView
    android:id="@+id/image_view"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:padding="5dp"
    android:layout_margin="10dp"
    android:layout_below="@id/textview"
    />
```

In onCreate()

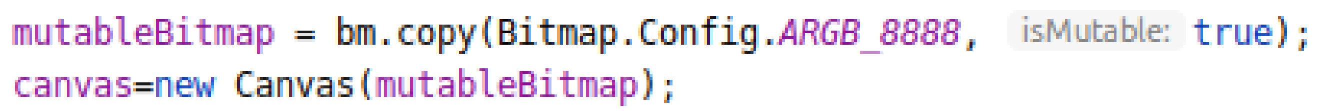
- display the image



```
iw= (ImageView)findViewById(R.id.image_view);
iw.setImageBitmap(bm);
```

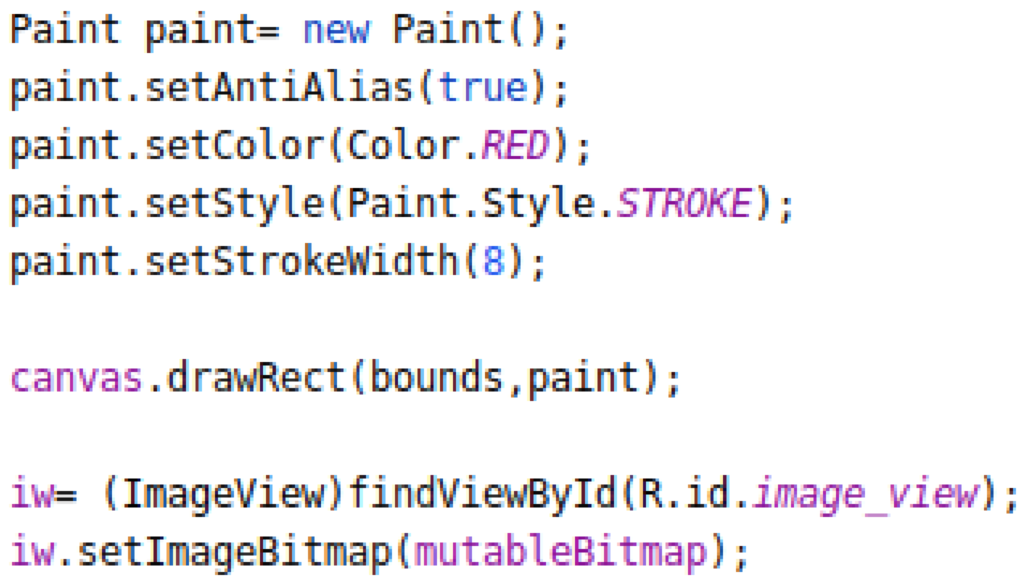
Use Canvas to draw the detection box

- in onCreate(), create a copy of the face image to draw upon



```
mutableBitmap = bm.copy(Bitmap.Config.ARGB_8888,  isMutable: true);
canvas=new Canvas(mutableBitmap);
```

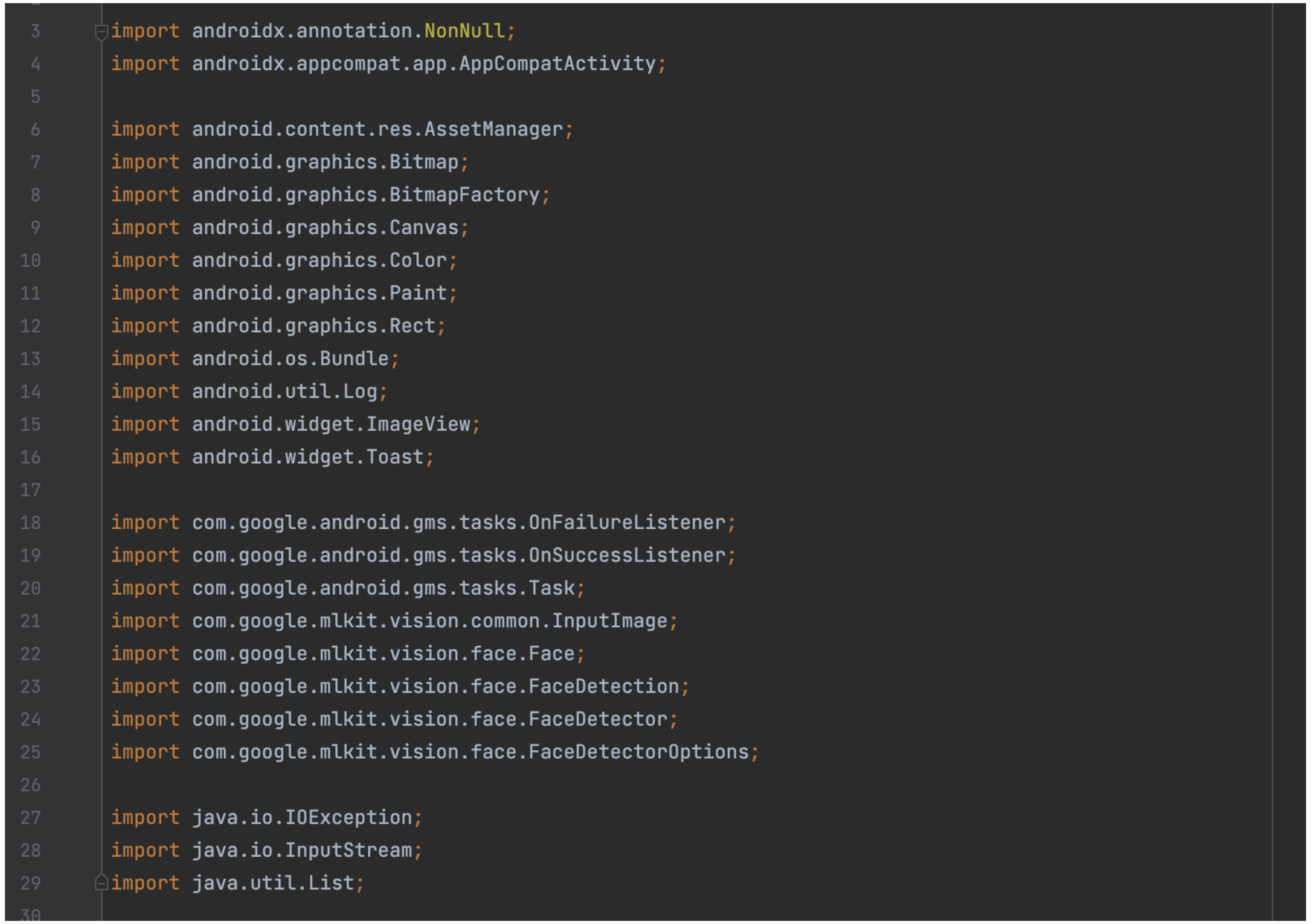
- When the face detection is successful, use the canvas to draw the detection boxes.



```
Paint paint= new Paint();
paint.setAntiAlias(true);
paint.setColor(Color.RED);
paint.setStyle(Paint.Style.STROKE);
paint.setStrokeWidth(8);

canvas.drawRect(bounds,paint);

iw= (ImageView)findViewById(R.id.image_view);
iw.setImageBitmap(mutableBitmap);
```

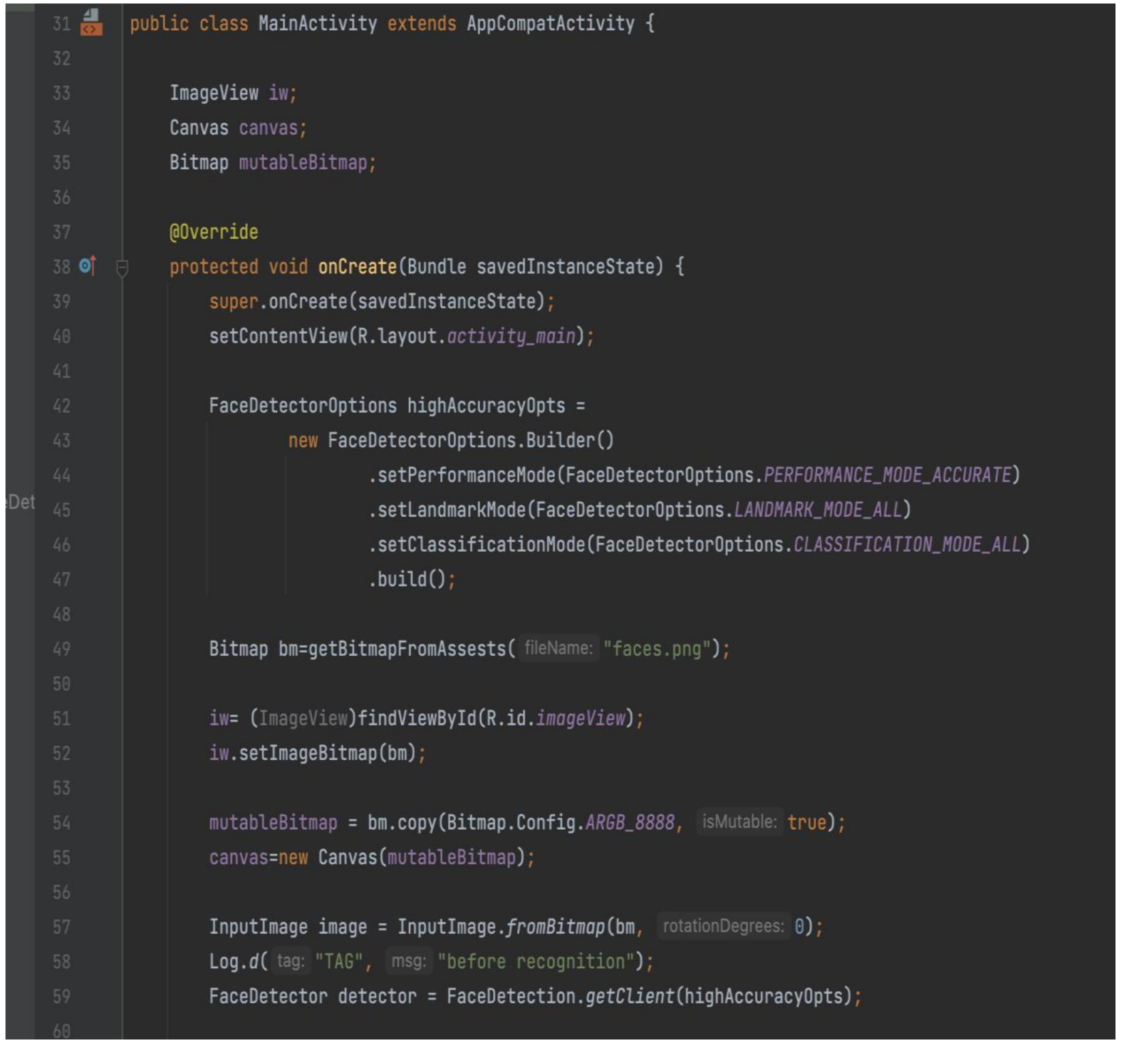
MainActivity. java

- Import section



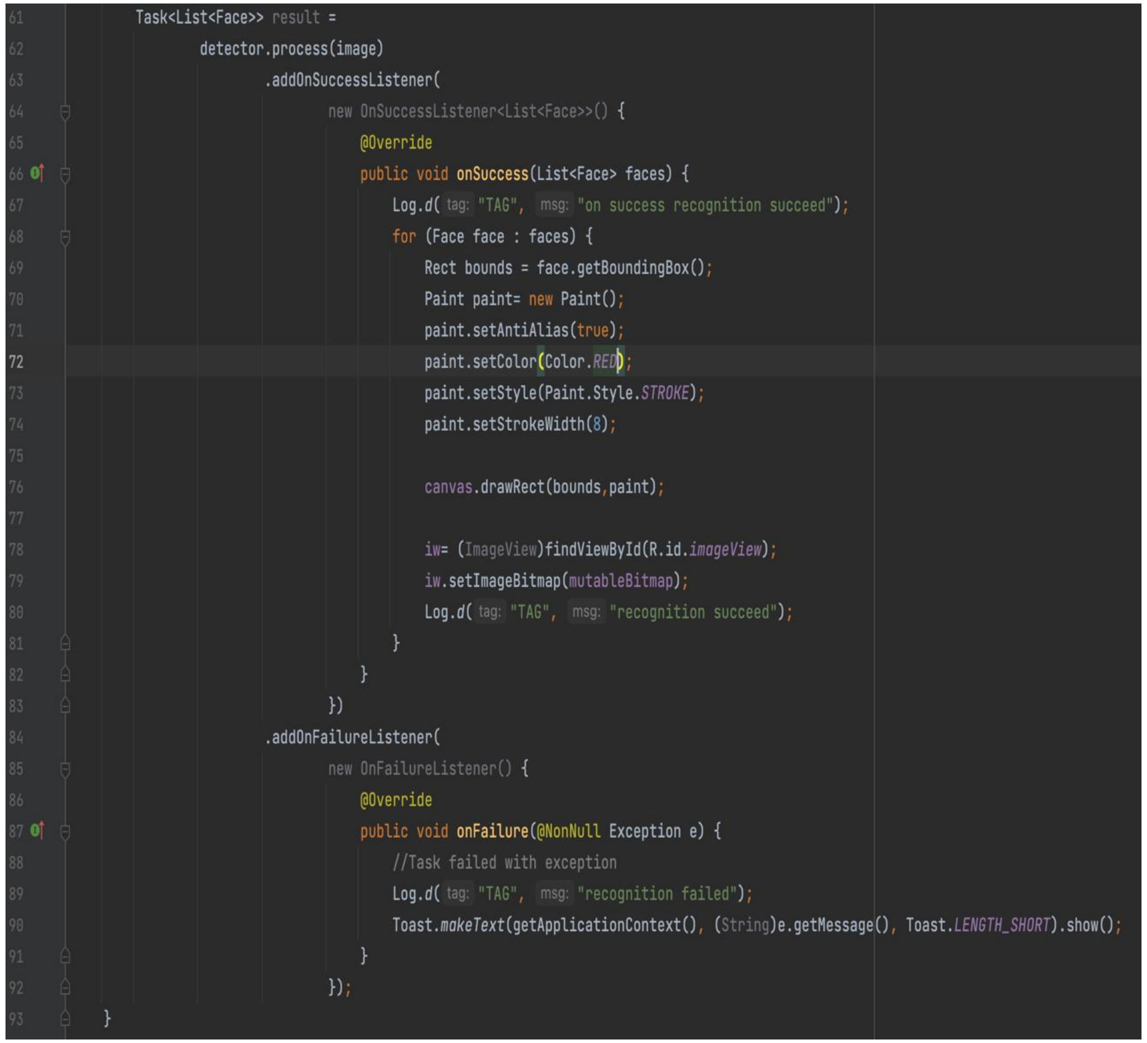
```java
import androidx.annotation.NonNull;
import androidx.appcompat.app.AppCompatActivity;

import android.content.res.AssetManager;
import android.graphics.Bitmap;
import android.graphics.BitmapFactory;
import android.graphics.Canvas;
import android.graphics.Color;
import android.graphics.Paint;
import android.graphics.Rect;
import android.os.Bundle;
import android.util.Log;
import android.widget.ImageView;
import android.widget.Toast;

import com.google.android.gms.tasks.OnFailureListener;
import com.google.android.gms.tasks.OnSuccessListener;
import com.google.android.gms.tasks.Task;
import com.google.mlkit.vision.common.InputImage;
import com.google.mlkit.vision.face.Face;
import com.google.mlkit.vision.face.FaceDetection;
import com.google.mlkit.vision.face.FaceDetector;
import com.google.mlkit.vision.face.FaceDetectorOptions;

import java.io.IOException;
import java.io.InputStream;
import java.util.List;
```

MainActivity. java



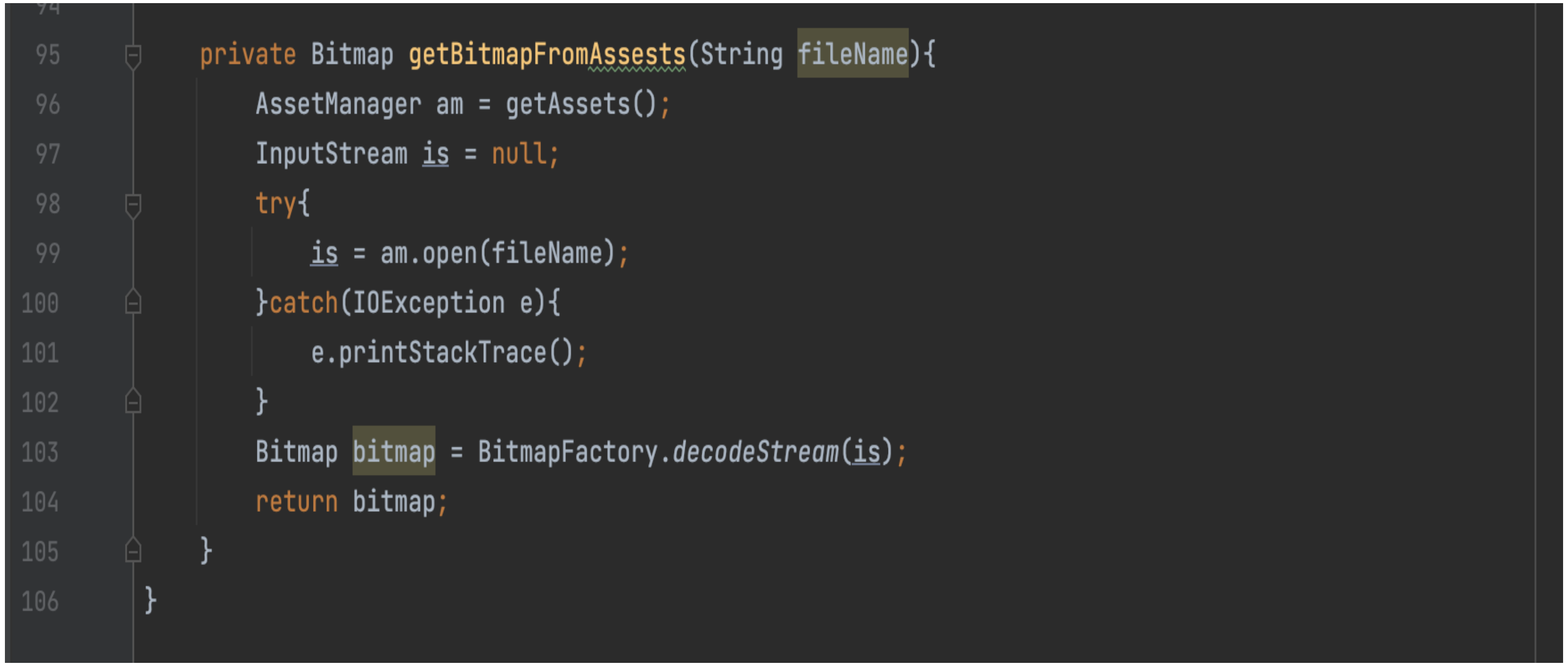
```
public class MainActivity extends AppCompatActivity {

    ImageView iw;
    Canvas canvas;
    Bitmap mutableBitmap;

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

        FaceDetectorOptions highAccuracyOpts =
                new FaceDetectorOptions.Builder()
                        .setPerformanceMode(FaceDetectorOptions.PERFORMANCE_MODE_ACCURATE)
                        .setLandmarkMode(FaceDetectorOptions.LANDMARK_MODE_ALL)
                        .setClassificationMode(FaceDetectorOptions.CLASSIFICATION_MODE_ALL)
                        .build();

        Bitmap bm=getBitmapFromAssests( fileName: "faces.png");

        iw= (ImageView)findViewById(R.id.imageView);
        iw.setImageBitmap(bm);

        mutableBitmap = bm.copy(Bitmap.Config.ARGB_8888,  isMutable: true);
        canvas=new Canvas(mutableBitmap);

        InputImage image = InputImage.fromBitmap(bm,  rotationDegrees: 0);
        Log.d( tag: "TAG",  msg: "before recognition");
        FaceDetector detector = FaceDetection.getClient(highAccuracyOpts);

```

Main activity 1



```
        Task<List<Face>> result =
                detector.process(image)
                        .addOnSuccessListener(
                                new OnSuccessListener<List<Face>>() {
                                    @Override
                                    public void onSuccess(List<Face> faces) {
                                        Log.d( tag: "TAG",  msg: "on success recognition succeed");
                                        for (Face face : faces) {
                                            Rect bounds = face.getBoundingBox();
                                            Paint paint= new Paint();
                                            paint.setAntiAlias(true);
                                            paint.setColor(Color.RED);
                                            paint.setStyle(Paint.Style.STROKE);
                                            paint.setStrokeWidth(8);

                                            canvas.drawRect(bounds,paint);

                                            iw= (ImageView)findViewById(R.id.imageView);
                                            iw.setImageBitmap(mutableBitmap);
                                            Log.d( tag: "TAG",  msg: "recognition succeed");
                                        }
                                    }
                                })
                        .addOnFailureListener(
                                new OnFailureListener() {
                                    @Override
                                    public void onFailure(@NonNull Exception e) {
                                        //Task failed with exception
                                        Log.d( tag: "TAG",  msg: "recognition failed");
                                        Toast.makeText(getApplicationContext(), (String)e.getMessage(), Toast.LENGTH_SHORT).show();
                                    }
                                });
    }
```

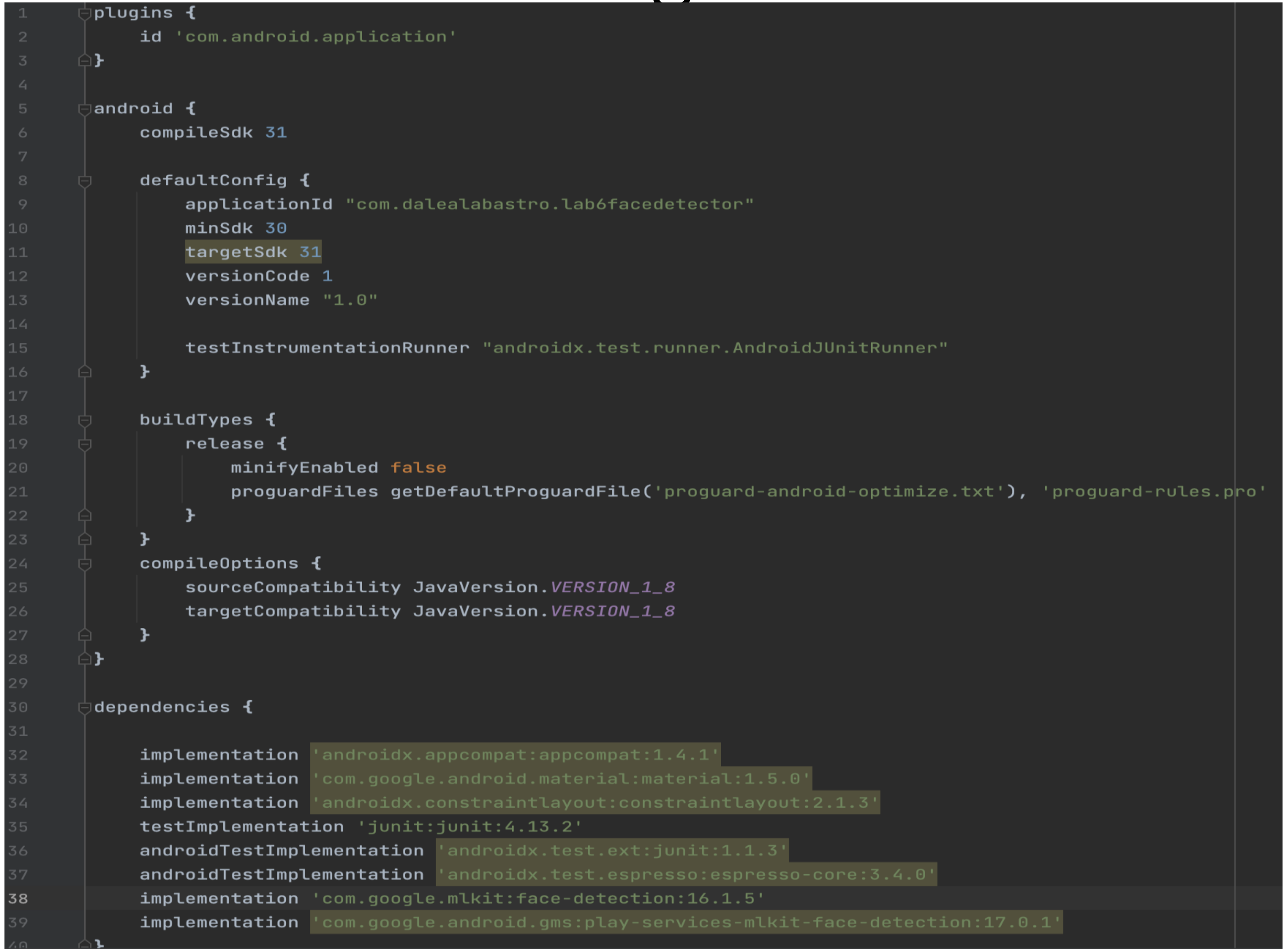
Main activity 2



```
    private Bitmap getBitmapFromAssests(String fileName){
        AssetManager am = getAssets();
        InputStream is = null;
        try{
            is = am.open(fileName);
        }catch(IOException e){
            e.printStackTrace();
        }
        Bitmap bitmap = BitmapFactory.decodeStream(is);
        return bitmap;
    }
}
```

Main Activity 3

Build gradle



```
plugins {
    id 'com.android.application'
}

android {
    compileSdk 31

    defaultConfig {
        applicationId "com.dalealabastro.lab6facedetector"
        minSdk 30
        targetSdk 31
        versionCode 1
        versionName "1.0"

        testInstrumentationRunner "androidx.test.runner.AndroidJUnitRunner"
    }

    buildTypes {
        release {
            minifyEnabled false
            proguardFiles getDefaultProguardFile('proguard-android-optimize.txt'), 'proguard-rules.pro'
        }
    }
    compileOptions {
        sourceCompatibility JavaVersion.VERSION_1_8
        targetCompatibility JavaVersion.VERSION_1_8
    }
}

dependencies {

    implementation 'androidx.appcompat:appcompat:1.4.1'
    implementation 'com.google.android.material:material:1.5.0'
    implementation 'androidx.constraintlayout:constraintlayout:2.1.3'
    testImplementation 'junit:junit:4.13.2'
    androidTestImplementation 'androidx.test.ext:junit:1.1.3'
    androidTestImplementation 'androidx.test.espresso:espresso-core:3.4.0'
    implementation 'com.google.mlkit:face-detection:16.1.5'
    implementation 'com.google.android.gms:play-services-mlkit-face-detection:17.0.1'
}
```