

# KHAN INSTITUTE OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

COMPUTER SCIENCE DEPARTMENT

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## CoffeeShop2: Mood-Based Coffee Recommendation Android Application

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### OPEN ENDED LAB PROJECT REPORT

Subject: Mobile Application Development (BSCS-5B)

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# 1 Introduction

With the rapid growth of mobile technology and artificial intelligence, modern applications are becoming more personalized and intelligent. CoffeeShop2 is an Android-based coffee shop application designed to enhance user experience through a **mood-based coffee recommendation system**.

The application uses the smartphone's front camera along with Google ML Kit to detect facial expressions and determine the user's mood. Based on the detected mood, the system recommends suitable coffee products, making the application interactive, engaging, and user-centric.

In addition to mood-based recommendations, the application also provides standard e-commerce features such as browsing coffee products, viewing categories, and accessing user-specific order history.

## 2 Objectives of the Project

The main objectives of this project are:

- To develop an Android-based coffee shop application using Java
- To detect user mood using facial expression analysis
- To recommend coffee products based on detected mood
- To integrate Firebase for authentication and data storage
- To enhance user experience through intelligent recommendations

## 3 Project Overview

CoffeeShop2 aims to bridge the gap between artificial intelligence and mobile commerce. The project introduces a smart recommendation feature that analyzes the user's facial expressions and maps them to predefined moods such as HAPPY, SAD, TIRED, CALM, and NEUTRAL. Each mood is linked to a specific coffee recommendation.

The application dynamically filters the product list to display only those items that match the recommended coffee, creating a personalized shopping experience.

## 4 Core Features

### 4.1 Mood-Based Recommendation System

- Real-time face detection using the front camera

- Facial feature analysis using Google ML Kit
- Mood classification based on smile and eye-open probabilities
- Automatic coffee recommendation for each detected mood
- Real-time filtering of product list

## 4.2 E-Commerce and Product Catalog

- Display of coffee items with images and descriptions
- Category-based product browsing
- Dynamic content loading from Firebase Realtime Database
- Popular items and promotional banners support

## 4.3 User Authentication and Data Management

- Firebase Authentication for login and signup
- User-specific order history
- Storage of mood detection and recommendation data

# 5 System Architecture

The application follows the **MVVM (Model–View–ViewModel)** architecture pattern to ensure separation of concerns and maintainability.

## 5.1 View Layer

The View layer consists of Activities and Fragments. RecommendationActivity handles camera operations, user interaction, and displays mood detection results.

## 5.2 ViewModel Layer

MainViewModel prepares UI-related data and communicates with the repository. It survives configuration changes and ensures smooth user experience.

## 5.3 Repository Layer

MainRepository acts as the single source of truth for data. It manages all interactions with Firebase, including products, orders, and mood records.

## 5.4 Model Layer

The Model layer includes data classes such as ItemModel, OrderModel, and MoodModel that define the structure of application data.

## 6 Technologies and Libraries Used

- Java (Android Development)
- Android Studio
- Firebase Realtime Database
- Firebase Authentication
- CameraX API
- Google ML Kit Face Detection
- RecyclerView
- ViewModel and LiveData

## 7 System Workflow

The mood-based recommendation workflow is as follows:

1. User opens RecommendationActivity
2. Camera permission is requested
3. Front camera preview starts using CameraX
4. Camera frames are analyzed using ImageAnalysis
5. ML Kit FaceDetector processes each frame
6. Mood is detected after consistent face detection
7. Coffee recommendation is generated
8. Mood and recommendation are saved to Firebase
9. Product list is filtered accordingly
10. Camera stops and results are displayed

## 8 Testing

The application was tested on both Android Emulator and physical devices. Testing focused on camera permissions, mood detection accuracy, Firebase data retrieval, and product filtering. All major functionalities worked as expected.

## 9 Limitations

- Mood detection accuracy depends on lighting conditions
- Rule-based emotion classification
- Single face detection support
- Internet connection required for Firebase services

## 10 Conclusion

CoffeeShop2 successfully demonstrates how artificial intelligence and mobile application development can be combined to create an intelligent recommendation system. The mood-based coffee suggestion feature enhances personalization and improves user engagement.

This project provided practical experience in Android development, Firebase integration, CameraX usage, and ML Kit-based facial analysis.

## 11 Future Enhancements

- Deep learning-based emotion recognition
- Multi-face detection support
- Payment gateway integration
- Personalized recommendations using user history
- Admin analytics dashboard

## 12 References

- Android Developers Documentation
- Google ML Kit Documentation

- [Firebase Official Documentation](#)
- [CameraX API Guide](#)