

**KHAN INSTITUTE OF
COMPUTER SCIENCE AND
INFORMATION TECHNOLOGY
COMPUTER SCIENCE DEPARTMENT**

Mobile App Development

**Open Ended Lab Report
Emergency Alert Android Application**

Submitted By:

Muhammad Bilal
232201100

Submitted To:

Sir Uzair Hassan
Department of Computer Science

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1 Introduction

In today's fast-paced and unpredictable world, quick access to help during emergencies can be life-saving. This project addresses a critical real-world problem: the delay in notifying trusted contacts during medical, safety, or environmental emergencies.

The **Emergency Alert Android Application** is designed to send instant, location-aware emergency notifications to pre-registered contacts with just one tap — significantly reducing response time in critical situations.

2 Problem Statement

Individuals often struggle to communicate their exact situation and location during emergencies due to panic, injury, or lack of time. Existing solutions are either too complex or lack real-time location sharing. This app provides a simple, intuitive, and reliable way to alert trusted people instantly with minimal user interaction.

3 Objectives

- Enable one-tap emergency alert triggering.
- Share real-time GPS location via Google Maps link.
- Support multiple emergency types (Medical, Safety, Accident, Fire).
- Ensure user data privacy and security.
- Provide a clean, accessible, and responsive UI.
- Integrate modern Android architecture and best practices.

4 Features Implemented

User Authentication	Email/Password login via Firebase Auth
Emergency SOS Button	Large, centrally placed button with confirmation & countdown
Emergency Type Selection	User selects context: Medical, Safety, Accident, Fire
Contact Management	Add/edit/delete up to 5 trusted contacts (stored in Room + synced to Firebase)
Location Tracking	Fetches precise GPS location only at alert time (privacy-first)
Alert System	Sends message with name, emergency type, live Google Maps location link, and timestamp via Firebase Cloud Messaging
Weather Integration	Displays current weather on Home Screen using OpenWeatherMap API
Alert History	List of previously sent alerts showing date, time, emergency type, and location snapshot
Dark Mode & Material You	Supports system dark mode and dynamic Material You color theming
Notifications	Firebase Cloud Messaging for instant alert delivery to contacts and confirmation to user

5 Technology Stack

Language	Kotlin
UI Framework	Jetpack Compose
Architecture	MVVM (Model-View-ViewModel)
Local Database	Room Persistence Library
Cloud Backend	Firebase (Authentication, Firestore, Cloud Messaging)
APIs Used	Google Maps/Location API, OpenWeatherMap API
Minimum Android Version	Android 8.0 (API 26)
IDE	Android Studio Hedgehog or later

6 App Architecture (MVVM)

- **Model:** Data models and Room entities
- **View:** Jetpack Compose UI screens
- **ViewModel:** Business logic and state management
- **Repository:** Data source abstraction (Room + Firebase)

This separation ensures testability, maintainability, and scalability.

7 Key Screens & Navigation

- Authentication Screens – Login / Register
- Home Dashboard – SOS button, weather, emergency type selector
- Contacts Screen – Manage emergency contacts (CRUD)
- Alert History Screen – Scrollable list using LazyColumn
- Confirmation Dialog – Prevents accidental SOS triggers

Navigation is handled via Jetpack Navigation Component.

8 Data Storage

- **Local:** Room Database for offline storage of contacts and history
- **Cloud:** Firebase Firestore for backup and cross-device sync
- **Security:** Firebase Authentication enforces user data isolation
- **Privacy:** Location fetched only when SOS is confirmed — never tracked continuously

9 Advanced Features

Firebase Authentication

REST API Integration (OpenWeatherMap)

Dark Mode Support

Material You Dynamic Theming

Real-time Location + Push Notifications (Core requirement)

10 Challenges Faced

- Requesting and handling runtime location permissions gracefully
- Ensuring FCM tokens are registered before sending alerts
- Managing OpenWeatherMap API rate limits with caching
- Preventing accidental SOS with countdown and confirmation
- Syncing local (Room) and cloud (Firestore) without duplication

11 Testing

- Unit tests for ViewModels using mock repositories
- Instrumented UI tests on multiple screen sizes
- Edge case handling: no internet, location denied, empty contacts

12 Future Enhancements

- SMS fallback when internet is unavailable
- Home screen widget for instant SOS
- 10-second voice recording during emergency
- Integration with local emergency services (e.g., 1122 in Pakistan)
- Multi-language support (Urdu, English)

13 Conclusion

The Emergency Alert Android Application delivers a practical, privacy-respecting solution to a critical safety problem. Built with Kotlin, Jetpack Compose, and MVVM architecture, it fulfills and exceeds all open-ended lab requirements. The app is robust, user-friendly, and ready for real-world use.

Note: This project is created for educational purposes.