RSET
RAJAGIRI SCHOOL OF
ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

Mini Project Report On

SafeCircle

Submitted in partial fulfillment of the requirements for the award of the degree of

Bachelor of Technology

in

Computer Science and Engineering

By

Kesiya Mariam Reji (U2203127)

Jyotsna Mariam Joji (U2203125)

Eujwal Joshi K (U2203090)

Jose Chemmanoor (U2203122)

Under the guidance of

Mr.Biju Abraham Narayamparambil

Department of Computer Science & Engineering
Rajagiri School of Engineering & Technology (Autonomous)
(Affiliated to APJ Abdul Kalam Technological University)
Rajagiri Valley, Kakkanad, Kochi, 682039
April 2025

CERTIFICATE

This is to certify that the mini project report entitled "SafeCircle- A Women's Safety App" is a bonafide record of the work done by ***Kesiya Mariam Reji (U2203127), Jyotsna Mariam Joji (U2203125), Eujwal Joshi K (U2203090), Jose Chemmanoor (U2203122)*** *submitted to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology (B.Tech.) in Computer Science and Engineering during the academic year 2024-2025.*

Mr. Biju Abraham Narayamparambil
Assistant Professor
Dept. of CSE
RSET
Project Guide

Dr. Jincy J. Fernandez
Associate Professor
Dept. of CSE
RSET
Project Coordinator

Dr. Preetha K.G.
Head of the Department
Dept. of CSE
RSET

ACKNOWLEDGEMENTS

We wish to express our sincere gratitude towards **Rev. Dr. Jaison Paul Mulerikkal CMI**, Principal of Rajagiri School of Engineering & Technology, and **Dr. Preetha K.G.**, Head of the Department of Computer Science and Engineering for providing us with the opportunity to undertake our mini project, “SafeCircle”.

We are highly indebted to our project coordinator, **Dr. Jincy J. Fernandez**, Associate Professor, Department of Computer Science and Engineering for her valuable support.

It is indeed our pleasure and a moment of satisfaction for us to express our sincere gratitude to our project guide **Mr. Biju Abraham Narayamparambil** for his patience and all the priceless advice and wisdom he has shared with us.

Last but not the least, we would like to express our sincere gratitude towards all other teachers and friends for their continuous support and constructive ideas.

Kesiya Mariam Reji

Jyotsna Mariam Joji

Eujwal Joshi K

Jose Chemmanoor

ABSTRACT

In today's unpredictable world, personal safety remains a growing concern—particularly for women who often face unsafe environments while commuting, traveling alone, or navigating unfamiliar areas. SafeCircle is a comprehensive personal safety application designed to act as a digital guardian, leveraging modern technology to provide real-time assistance, prevention, and connectivity. The primary goal of SafeCircle is to empower women with tools that enhance their sense of security and enable swift response during emergencies. SafeCircle offers a wide range of features including SOS alert systems, AI-powered safe route suggestions, live location sharing, geo-fencing, and emergency contact notifications. These functionalities are thoughtfully integrated to provide rapid support in distress situations. An AI-based model continuously improves safe route predictions by analyzing real-time data, environmental factors, and user feedback, helping users make safer decisions about their travel. Additionally, crowdsourced incident reporting allows users to contribute to and benefit from a community-driven safety network. The application is built using React Native, ensuring cross-platform support for Android, iOS, and web users. It also includes smartwatch integration for quick, on-the-go alert activation. Firebase Authentication enables secure login through email while user profiles allow customization of emergency preferences and contacts. SafeCircle emphasizes usability, inclusivity, and accessibility. Its intuitive interface aims to make safety tools accessible to users from various backgrounds. While an active internet connection is required for real-time features like safe route access, efforts are underway to incorporate offline functionality for critical features such as SOS activation and local alerts. Future enhancements include integration with government safety systems, automatic audio & video recording, voice-activated emergency triggers, and creating a SafeCircle social network . By combining integrated safety tools, community support, and technology-driven solutions, SafeCircle strives to become a reliable, everyday safety companion that puts user empowerment and well-being first.

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CHAPTER 1

INTRODUCTION

SafeCircle is a personal safety mobile application designed to enhance the safety of individuals, particularly women, in urban and rural environments. The app aims to provide a comprehensive safety solution that integrates key features such as emergency SOS triggers, live location sharing, safe route suggestions, and real-time community alerts. By leveraging both mobile and wearable technologies, SafeCircle ensures that users have immediate access to safety tools, whether they are on the move or in a vulnerable situation. This project is motivated by the growing need for practical solutions to address safety concerns, especially in cities and remote areas where users may face various risks while traveling or commuting.

1.1 Background

In today's fast-paced world, personal safety has become a growing concern, particularly for individuals traveling alone. Despite the advancements in technology, there remains a gap in providing effective, real-time solutions for ensuring personal safety. Mobile applications and wearables have the potential to address this issue by enabling real-time alerts, tracking, and community-based reporting. However, existing safety applications often lack integration, provide limited functionality, or are not widely adopted by the community. SafeCircle seeks to fill this gap by offering a multi-functional, user-friendly solution that not only helps individuals in emergencies but also fosters a sense of community and shared responsibility in ensuring safety.

1.2 Problem Definition

- Problem: Traditional safety tools such as manual emergency calls or messages are time-consuming, lack real-time intelligence, and often fail to offer discreet or proactive help.
- Solution: SafeCircle is designed to offer a smart, efficient, and discreet personal safety solution using AI, real-time GPS, community reporting, and multi-platform access to support individuals in emergencies and promote safer mobility.
- Aim: To develop an intelligent safety app that empowers users—especially women—by providing predictive, preventive, and responsive tools for managing personal safety through mobile, web, and wearable technology.

1.3 Scope and Motivation

- Scope: The scope of SafeCircle includes the design, development, and deployment of a cross-platform personal safety application using React Native to support Android, iOS, web, and smartwatch devices. Key features include SOS alerts, safe route suggestions based on AI, incident reporting, customizable emergency contacts, and in-app communication with nearby users. The app will also enable real-time location tracking, integrate with Firebase Authentication, and be compatible with third-party services like Supabase and Google Maps. Limitations such as offline access and dependency on internet services for location tracking are acknowledged but planned for future enhancements.
- Motivation: The rising incidents of gender-based violence, coupled with the limitations of conventional safety mechanisms, inspired the development of SafeCircle. By integrating cutting-edge technology with user-friendly design, SafeCircle aims to offer reliable, fast, and discreet support in moments of danger, empowering users to navigate daily life with greater confidence and peace of mind.

1.4 Objectives

- Enhance Personal Safety: Offer tools like SOS, Geofencing, and live tracking to increase individual safety.
- Predict Safe Routes: Use AI to recommend real-time, safe routes based on environmental and crime data.
- Enable Swift Emergency Communication: Instantly notify emergency contacts with alerts and location data.
- Empower Users: Encourage self-reliance through smart safety features and user control.
- Foster Community Support: Allow incident reporting and alerts for nearby users to build a shared safety network.
- Ensure Accessibility and Inclusivity: Design for all users, including the elderly, children, and individuals with medical needs.

1.5 Challenges

While developing SafeCircle, several challenges have been encountered:

1. Real-time data processing: Integrating live data for location tracking, traffic updates, and crowd-sourced safety reports requires effective backend infrastructure that ensures timely and accurate updates.
2. Wearable integration: Ensuring seamless functionality between the mobile app and wearable devices while maintaining performance and battery efficiency.
3. Privacy and security: Safeguarding users' sensitive data, including location and personal information, is a critical challenge. The app must balance security with ease of use.
4. User adoption: Encouraging people to use the app regularly, especially in non-emergency situations, and to rely on community-driven features, can be a significant hurdle.
5. Offline Functionality: Developing features that work during network outages or low-connectivity scenarios.

1.6 Assumptions

The following assumptions were made during the development of SafeCircle:

1. Access to modern smartphones and wearable devices: The app is designed for users who own smartphones with GPS capabilities and are willing to use compatible wearable devices.
2. Network availability: The app assumes that users will have access to a stable internet or network connection, especially for real-time alerts and location sharing.
3. User willingness to share data: It is assumed that users will be comfortable with the app's data sharing features, especially location sharing and incident reporting, which are critical for the community-based safety system.

1.7 Societal / Industrial Relevance

SafeCircle holds immense relevance in both societal and industrial contexts. It addresses pressing issues such as women’s safety, emergency preparedness, and community-driven security. Societally, it empowers individuals to respond proactively to threats and fosters a collaborative safety network. In industries like healthcare, transportation, education, and hospitality, SafeCircle can be integrated into employee and student safety programs,

ensuring well-being in workplaces, campuses, and public transport. The app also aligns with the broader goals of smart cities and public safety tech, offering scalable solutions for urban safety challenges.

1.8 Organization of the Report

The report is structured into six comprehensive chapters. Chapter 1, Introduction presents an overview of the SafeCircle project, detailing the background of personal safety issues, the problem definition related to emergency communication gaps, project scope and motivation, key objectives, development challenges, underlying assumptions, and the societal and industrial relevance of the solution. Chapter 2, Software Requirements Specification outlines the functional and non-functional requirements, including overall descriptions, system features like SOS alerts and maps, and external interface dependencies such as Google Maps APIs. Chapter 3, System Architecture & Design provides a holistic view of the system's structure, covering architectural design, methodologies and algorithms (e.g., AI-based routing), user interface design with screen mockups, detailed implementation strategies, module division, and a Gantt chart illustrating the work schedule. Chapter 4, Results and Discussions interprets the outcomes through testing scenarios, quantitative results (like model performance), and thoughtful analysis of patterns, supported by visual data and a concluding summary. Chapter 5, Conclusion reflects on the project's success in meeting its goals, outlines potential future enhancements, and summarizes the key contributions. Chapter 6, References lists all cited academic and technical sources, ensuring the credibility and traceability of the report.

1.9 Summary

This chapter introduced the SafeCircle project, highlighting its purpose, objectives, and motivation for enhancing personal safety, particularly for women. It identified the problems faced by individuals in urban and rural environments and how SafeCircle addresses these challenges through an integrated mobile and wearable solution. The report aims to provide a comprehensive view of the system design, functional and non-functional requirements, and implementation details, ultimately contributing to the development of an innovative safety application for the community.

CHAPTER 2

SOFTWARE REQUIREMENT SPECIFICATION

2.1 Introduction

2.1.1 Purpose

Crimes and accidents in urban and rural settings are increasing at a high rate , especially for women and other vulnerable groups, the need for a robust personal safety solution has never been more critical. Many people feel unsafe while traveling alone, especially during odd hours or in unfamiliar areas. While traditional emergency response services are available, they may not always be timely or accessible in every situation. SafeCircle aims to address these gaps by offering features like SOS alerts, live location tracking, and AI-driven safe route suggestions, ensuring individuals can navigate their surroundings with confidence and get immediate assistance in emergencies.

- Mobile App: Emergency SOS triggers, live location sharing, safe route suggestions, and community alerts.
- Wearable Integration: It associates features like SOS activation and mirrored notifications.
- Backend & AI Model: Data processing, user feedback analysis, and safe route recommendations using real-time and crowdsourced data.

2.1.2 Product Scope

SafeCircle is a personal safety app designed to empower users during emergencies and promote secure navigation in both urban and rural areas. It integrates smartphones and wearables to deliver SOS alerts, real-time location sharing, AI-based safe route suggestions, and community-driven incident reporting.

- Purpose: The app enhances personal security by enabling quick SOS activation and live location sharing during emergencies. It builds community awareness through real-time incident reporting and alerts, helping users stay informed about local risks. AI-driven navigation provides safe travel routes based on traffic, infrastructure, and user feedback. Integration with smartwatches allows hands-free access to safety features, ensuring users can trigger alerts and receive notifications without relying solely on their phones.

- Objectives: SafeCircle's core objective is to create an intuitive, feature-rich app that enhances personal safety. It utilizes AI for real-time, data-informed route suggestions and supports a scalable, user-powered safety network. Incident reporting and alert features keep users updated on risks. The app also includes seamless smartwatch integration for hands-free emergency access.
- Benefits: SafeCircle offers reliable emergency tools and fosters a community of shared safety awareness through incident reporting. Its AI-powered navigation steers users away from danger zones, while voice commands, haptic feedback, and wearable support enhance accessibility, making the app inclusive and user-friendly.
- Business Alignment: SafeCircle aligns with organizational goals by harnessing technology for positive social impact. It enhances the user experience while offering scalable, data-driven safety solutions with strong market potential.

2.2 Overall Description

2.2.1 Product Perspective

SafeCircle aims to develop an intuitive application equipped with essential emergency features to enhance personal safety. By leveraging AI, the app provides real-time safe route suggestions, helping users navigate securely based on live data and user feedback. It fosters a scalable, community-driven safety network where individuals can report incidents and stay informed about potential risks.

2.2.2 Product Functions

- Emergency SOS Trigger that sends alerts with real-time location to selected contacts.
- Safe Route Suggestions provide AI-driven navigation based on street lighting data, institutions data,road conditions data.
- Users can contribute to safety with Incident Reporting, mapping issues like harassment or theft for community awareness .
- The Community Alert System notifies nearby users of reported dangers.
- Simulation of a fake call feature to deter potential threats.
- Live Location Sharing allows users to share their real-time location with emergency contacts.
- Panic Alarm Sound triggering a loud alarm on the user's phone during an emergency to attract attention and deter potential threats.

2.2.3 Operating Environment

(1) Hardware & OS

- Smartphones: Compatible with Android 8.0 and above, ensuring accessibility for modern devices.
- Smartwatches: Supports models like Noise and Honor which have notification mirroring.
- Backend: Powered by cloud platforms like Supabase for scalability and performance.

(2) Software Components

- Frontend: React Native for seamless cross-platform compatibility and efficient performance.
- Backend: Utilizes Supabase to manage real-time data, messaging, and user authentication securely.
- Navigation: Has OpenStreetMap API, Google Maps API for accurate safe route suggestions.
- Database: Supabase used for efficient storage of incident reports and user feedback data.

(3) Integration & Connectivity

- Online Mode: Enables live location tracking, route suggestions, incident reporting, and emergency alerts for real-time safety.

2.2.4 Design and Implementation Constraints

- Regulatory Compliance: Must comply with GDPR, CCPA, India's IT Act, and emergency alert protocols.
- Hardware Limitations: Works on smartphones with 2GB RAM, and limited processing power. Smartwatch compatibility depends on Bluetooth connection.
- Third-Party Integrations: Dependent on Google Maps API, OpenStreetMaps API Supabase, SMS gateways, and smartwatch OS/Bluetooth .
- Technologies: Built with React Native, Supabase backend, and lightweight ML algorithms.
- Design Standards: Follows Android Material Design and clean architecture.

2.2.5 Assumptions and Dependencies

- Third-Party Services: Relies on OpenStreetMaps API, Google Maps API, Supabase, SMS gateways; changes may impact functionality.
- Smartwatch Integration: Assumes compatibility with Bluetooth; limitations in device support may arise.
- Cloud Infrastructure: Depends on Supabase for backend; platform changes may affect performance.
- OS Compatibility: Assumes support for Android 8.0+ and smartwatch OS; updates may require adjustments.
- External APIs: Changes to Google Maps/OpenStreetMap could affect routing and location services.
- Data Privacy Regulations: Assumes continued compliance with GDPR, CCPA, India's IT Act; changes may require updates.
- User Feedback: Assumes AI features will be well-received; negative feedback may require refinements.
- Hardware Compatibility: Assumes smartphones with 2GB RAM and supported wearables; changes in hardware may affect performance.

2.3 External Interface Requirements

2.3.1 User Interfaces

A. Mobile Application Interface

● Home Screen: Quick access to SOS button, Safe Route Suggestion, Incident Reporting, Panic Alarm, Fake Call, User reported incidents, Settings option.

● SOS Button: Large, color-coded for visibility; one-tap activation for alerts and location sharing.

● Incident Reporting: User-friendly form with text input option.

● Settings Screen: Configure emergency contacts settings, fake call settings, smart watch settings.

B. Smartwatch Interface

● SOS Trigger: Provides a dedicated button or gesture on the smartwatch for immediate SOS activation, enhancing accessibility.

C. GUI Standards and Style Guidelines

- Design: Adheres to Android Material Design principles, utilizing contrasting colors and large buttons to enhance visibility.
- Navigation: Incorporates standard back and home buttons, complemented by intuitive icons for seamless user experience.

2.3.2 Hardware Interfaces

A. Smartphone Hardware Interfaces

- Device Type: Designed for Android smartphones with a minimum of 2GB RAM and built-in GPS functionality to ensure seamless location tracking and emergency response capabilities.
- Protocols:
  - ○Bluetooth: Ensures connectivity to smartwatches for the purpose of synchronizing SOS feature.
  - ○ Wi-Fi & Mobile Data: Supports backend communication to enable live location tracking, incident reporting, and receiving route suggestions with minimal delays.
  - ○ SMS: Facilitates the transmission of emergency alerts and allows directaccess to emergency contacts without delays.

B. Smartwatch Hardware Interfaces

- Device Type: Designed to support Android-based smartwatches, including popular models such as Noise and Fitbit, ensuring seamless integration and enhanced safety features for users.

C. External Hardware (Optional)

- Smart Glasses & Sensors: Equipped with Bluetooth technology to relay essential data, such as real-time location and SOS alerts, ensuring immediate response in critical situations. These devices also support health monitoring features, including heart rate tracking, to enhance overall personal safety and awareness during emergencies.

D. User Input Methods

- Touchscreen: Utilized for SOS activation and accessing settings, ensuring quick and intuitive control for emergency situations.

2.3.3 Software Interfaces

- Database: Supabase stores user data, incident reports, and location data, ensuring scalability and efficient data retrieval.
- Operating System: Android (v8.0+) serves as the main platform, with the future updates planned for Wear OS and watchOS for broader compatibility.
- APIs: Google Maps API provides route suggestions, location tracking, and alternate path recommendations to enhance navigation.
- OpenStreetMap API: Offers mapping services for flexibility and improved safe route suggestions.
- Programming Libraries/Frameworks: React Native enables cross-platform front end development, ensuring uniform experiences across devices.
- Google Colab: Powers AI-driven safe route suggestions with low-latency predictions,tailored for mobile devices.
- Shared Data & Messages: Incoming data includes user location, emergency requests, while outgoing data covers incident alerts, SMS to emergency contact list.
- Security: HTTPS and SSL/TLS ensure encrypted data transmission.

2.3.4 Communication Interfaces

- Communication Protocols: HTTP/HTTPS protocols ensure secure communication between the app and backend systems, safeguarding user data at all times.
- Network Requirements: Mobile data or Wi-Fi is necessary for location updates, notifications, and real-time tracking, ensuring continuous safety features.
- Security Standards: SSL/TLS encryption secures data transmission, while OAuth 2.0 and JWT protocols authenticate users and protect sessions.
- Synchronization Mechanisms:Supabase allows real-time data synchronization.
- Data Storage & Privacy: User data, including incident reports and profiles, is securely stored in Supabase with row-level security policies to prevent unauthorized access and ensure user privacy.
- Error Handling & Redundancy: The system implements retry mechanisms and fallback options during network failures to maintain core safety features like SOS alerts and fake call triggers, even in low connectivity scenarios.

2.4 System Features

2.4.1 Safe Route Suggestion Using AI

A. Description and Priority
Safe Route Suggestion uses artificial intelligence to suggest safest routes factoring in road conditions data ,street lighting facility & nearby police stations and institutions.Enhances user security by providing updated , highly accurate safe route recommendations.

- Priority: High
- Benefit: 9
- Penalty: 8
- Cost: 7
- Risk: 6

B. Stimulus/Response Sequences
The user inputs their destination, prompting the system to suggest the safest route.
C. Functional Requirements

- REQ-1: Analyze street lighting data, road conditions data, and safety infrastructure for safe route suggestions.
- REQ-2: This involves displaying the calculated route.

2.4.2 SOS Button & Emergency Alerts

A. Description and Priority
This feature enables users to send emergency alerts to contacts with a single tap of the SOS button.

- Priority: High
- Benefit: 9
- Penalty: 9
- Cost: 6
- Risk: 5

B. Stimulus/Response Sequences
When the user presses the SOS button, the system sends alerts to emergency contacts and sharing the real-time location.
C. Functional Requirements

- REQ-1:Send emergency alerts with location to the contacts list of the user.
- REQ-2: Ensure alerts reach contacts even in low-connectivity scenarios through SMS etc.

- REQ-3: Integration with wearable devices is required for quicker and easier SOS access.

2.4.3 Crowdsourced Safety Feedback

A. Description and Priority
This feature allows users to report safety concerns, which are shared with the SafeCircle community to help others avoid unsafe areas and make informed route choices.

- Priority: Medium
- Benefit: 8
- Penalty: 7
- Cost: 5
- Risk: 4

B. Stimulus/Response Sequences
When the user reports an unsafe event, the system logs the report and displays it on the map for nearby users to be aware of. If the user views the map for safety feedback, the system displays markers indicating safety concerns.
C. Functional Requirements

- REQ-1:This involves facilitating users to report safety incidents.
- REQ-2: Display a log of reported incidents that is filterable by type, severity, and date.
- REQ-3: To enable users to provide feedback & as well as view other app user's reports.

2.4.4 Fake Call Feature

A. Description and Priority
This feature allows users to simulate a fake call to deter potential threats.

- Priority: Medium
- Benefit: 7
- Penalty: 6
- Cost: 4
- Risk: 5

B. Stimulus/Response Sequences
If the user activates a fake call, the system simulates an incoming call with a ringtone and screen, providing a quick way to deflect attention.

When the user answers or cancels the fake call, the system deactivates the fake call screen without leaving any trace, ensuring privacy and security for the user.

C. Functional Requirements

- REQ-1:To provide a fake call feature with a ringtone for the user with a user chosen name.
- REQ-2:Makes sure that the fake call generated mimics an actual incoming call interface.
- REQ-3:This allows the users to cancel the fake call without sending alerts to other people

2.4.5 Live Location Sharing

A. Description and Priority

This feature allows users to share their real-time location with emergency contacts during an emergency.

- Priority: High
- Benefit: 9
- Penalty: 9
- Cost: 6
- Risk: 5

B. Stimulus/Response Sequences

When the user activates SOS, the system triggers live location sharing, continuously updating and sharing the user's location with contacts. If the user deactivates SOS, the system stops location sharing.

C. Functional Requirements

- REQ-1:To enable real-time location sharing facility.
- REQ-2: This enables to stop location sharing when the SOS is deactivated by the user.
- REQ-3: Helps in Integration with Android location services for accurate,timely updates.

2.4.6 Panic Alarm Sound

A. Description and Priority

This feature triggers a loud alarm on the user's phone during an emergency to attract attention and deter potential threats.Effective to alert nearby people, potentially scaring off attackers.

- Priority: Medium
- Benefit: 8
- Penalty: 6
- Cost: 4
- Risk: 4

B. Stimulus/Response Sequences

When the user activates the panic alarm, the system triggers a loud alarm sound to alert others nearby. If the user deactivates the alarm, the system silences the sound and restores the phone to its normal state. In the event the user accidentally triggers the alarm, the system provides a quick cancel option within a few seconds, allowing the user to stop the alarm immediately without further disruption.

C. Functional Requirements

- REQ-1:To provide an option to users to trigger a loud panic alarm through the application.
- REQ-2: Provides an alarm that must be loud to attract the attention of nearby people.
- REQ-3: Allow quick cancellation of the alarm to avoid false activation in case it occurs.
- REQ-4: Restoration of the user's phone to its normal state is enabled after deactivation.

2.4.7 Incident Maps

A. Description and Priority

This feature provides a map displaying reported safety incidents, helping users avoid dangerous areas and make informed route choices.Critical for real-time safety awareness.

- Priority: High
- Benefit: 9
- Penalty: 8
- Cost: 6
- Risk: 5

B. Stimulus/Response Sequences

When the user opens the map and clicks onto a particular point in the map, the system displays the type of issue reported there along with a description of the incident.

C. Functional Requirements

- REQ-1:Display the map of safety incidents for users's concerns.

- REQ-2:Requirement to allow app's users to view detailed descriptions of incidents.

2.4.8 Smartwatch Integration

A. Description and Priority
This feature integrates SafeCircle with smartwatches through a GUI in the form of a simulation, allowing users to send SOS alerts,enable panic alarms on their smartwatches.

- Priority: Medium
- Benefit: 8
- Penalty: 7
- Cost: 6
- Risk: 4

B. Stimulus/Response Sequences
When the user activates SOS from their smartwatch, the system sends emergency alerts and shares the user's location, similar to the mobile app.
C. Functional Requirements

- REQ-1:Enable SOS activation from smartwatch with the same actions as the mobile app.
- REQ-2: Synchronize actions between the smartwatch and mobile app for consistency.
- REQ-3: Requires to ensure compatibility with various smartwatch operating systems.

2.5 Other Nonfunctional Requirements

2.5.1 Performance Requirements

- Real-time Response: SOS button must trigger alerts and location sharing within 10 seconds.
- Map Loading: Incident maps and safe route suggestions must load in 5-6 seconds under typical network conditions.

2.5.2 Safety Requirements

- Safeguarding User Data: Ensure the accuracy of location data shared during emergencies.

- Regulatory Compliance: Comply with local safety regulations and emergency communication protocols.
- Minimizing Distraction: Ensure features like the SOS button and easily accessible and non-distracting during high-stress situations.

2.5.3 Security Requirements

- User Authentication: Secure logins with strong passwords for accessing sensitive features.
- Access Control: Only authorized users (emergency contacts, registered authorities) can access real-time location.
- Compliance: Comply with regional privacy regulations (e.g., DPDP) to protect user privacy.

2.5.4 Software Quality Attributes

- Reliability: Ensures 99.9% uptime for the SOS function, providing consistent performance.
- Usability: Features an intuitive user interface, allowing users to take emergency actions within two steps for quicker responses.
- Maintainability: Employs a modular codebase to simplify updates and enable seamless addition of new features.
- Testability: Ensures easy testing of critical features like SOS alerts, location sharing, and multimedia for meeting performance standards.
- Portability: Fully compatible across platforms, including Android and iOS, to support a wide range of devices.
- Adaptability: Allows the localization of safety features to meet region-specific needs for enhanced user relevance and protection.

2.6 Summary

The SafeCircle application is a comprehensive personal safety solution designed to empower users with real-time emergency response features, AI-driven safe route suggestions. By leveraging mobile and wearable technology, AI-based analytics, the system enhances situational awareness and provides quick access to emergency assistance.

A. Background and Problem Definition :In today's fast-paced world, personal safety during travel, especially in unfamiliar or low-surveillance areas, has become a growing concern. There is a need for a system that intelligently suggests safer travel routes, especially for vulnerable groups such as women, children, and night commuters.

B. Scope and Motivation :SafeCircle aims to bridge the gap between navigation and personal safety. The app is designed to predict route safety using AI, alert users about unsafe paths.The motivation arises from increasing safety incidents reported during travel and the lack of intelligent safety-first navigation solutions.

C. Objectives :

- Enhance Personal Safety: Offer tools like SOS, panic alarms to increase individual safety.
- Predict Safe Routes: Use AI to recommend real-time, safe routes based on historic data.
- Enable Swift Emergency Communication: Instantly notify emergency contacts with alerts and location data.
- Foster Community Support: Allow incident reporting for users to build a shared safety network.

D. Challenges :

While developing SafeCircle, several challenges have been encountered:

- Real-time data processing: Integrating live data for location tracking, traffic updates, and crowd-sourced safety reports requires effective backend infrastructure that ensures timely and accurate updates.
- Privacy and security: Safeguarding users' sensitive data, including location and personal information, is a critical challenge. The app must balance security with ease of use.
- User adoption: Encouraging people to use the app regularly, especially in non-emergency situations, and to rely on community-driven features, can be a significant hurdle.
- Offline Functionality: Developing features that work during network outages or low-connectivity scenarios.

E. Assumptions :

- Access to modern smartphones and wearable devices: The app is designed for users who own smartphones with GPS capabilities and are willing to use compatible wearable devices.
- Network availability: The app assumes that users will have access to a stable internet or network connection, especially for real-time alerts and location sharing.
- User willingness to share data: It is assumed that users will be comfortable with the app's data sharing features, especially location sharing and incident reporting, which are critical for the community-based safety system.

F. Societal / Industrial Relevance :

SafeCircle holds immense relevance in both societal and industrial contexts. It addresses pressing issues such as women's safety, emergency preparedness, and community-driven security. Societally, it empowers individuals to respond proactively to threats and fosters a collaborative safety network. In industries like healthcare, transportation, education, and hospitality, SafeCircle can be integrated into employee and student safety programs, ensuring well-being in workplaces, campuses, and public transport. The app also aligns with the broader goals of smart cities and public safety tech, offering scalable solutions for urban safety challenges.

G. Organization of the Report :

The report is structured into sections like Introduction, Software Requirements Specification and System Architecture and Design.

(1) Features and Requirements

- Safe Route Suggestion Using AI
- SOS Button & Emergency Alerts
- Crowdsourced Safety Feedback
- Live Location Sharing
- Panic Alarm Activation
- Incident Maps

(2) Non-functional Requirements

- Performance Requirements - Real time response of SOS trigger, map loading speed.

- Safety Requirements - safeguarding user data, regulatory compliance, minimising distraction.
- Security Requirements - user authentication, access control.
- Software Quality Attributes - reliability, usability, maintainability, testability.

CHAPTER 3

SYSTEM ARCHITECTURE & DESIGN

3.1 System Overview

SafeCircle is a personal safety application developed with the core aim of empowering women by providing emergency support functionalities through mobile and smartwatch platforms. The app enables users to swiftly trigger alerts, access assistance, and receive AI-based safe call suggestions based on current location safety. This section outlines the system's architectural model, component functionalities, algorithms, and the user interface layout, showcasing how various modules collaboratively enhance user safety.

The arrangement of the system components is as shown in Figure 3.3.

3.1.1 Architecture

The architecture of SafeCircle follows a client-server model, with mobile devices (React Native app) and smartwatch (Figma prototype) acting as clients and Supabase/Firebase services handling backend operations such as authentication, storage, and messaging.

A. Client-Side Components:

- User Interface (UI)- Developed in React Native, the UI includes screens for home, login, registration, incident reporting, and settings. The interface supports user interactions like SOS triggering, fake call simulation, and panic alarm.
- Panic Alarm Button- A loud siren is triggered to draw nearby attention in emergency situations hence seek community support.
- Fake Call Button- Plays a pre-scheduled fake call ringtone simulating an incoming call to help the user escape dangerous or uncomfortable situations.
- Incident Reporting Form- Allows users to report safety incidents by submitting details like location, type of incident, and time.
- SOS Button- Integrated on the home screen and linked to the smartwatch prototype, sos triggers an emergency alert and shares real-time location with emergency contacts, as shown in Figure 3.1 .

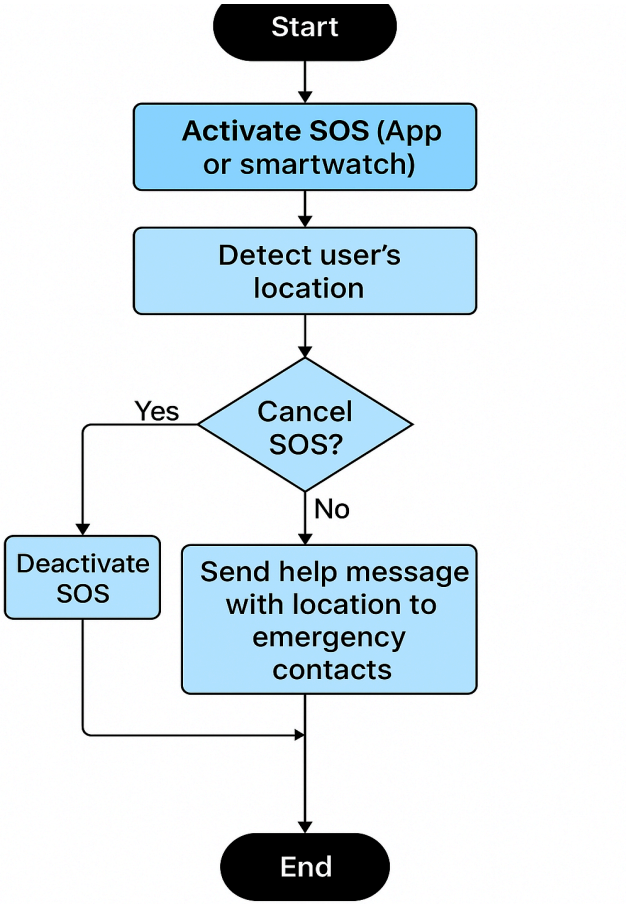


Figure 3.1: SOS activation

- AI-Based Safe Call Feature- Combines safety score analysis (60%) and Dijkstra's algorithm (40%) to recommend the safest person/location to contact. It avoids high-risk paths or areas.
- Settings Tab- Enables configuration of:
    - Fake call preferences
    - Emergency contacts
    - Smartwatch pairing
    - User profile details
- Smartwatch Pairing Support- Allows pairing via Bluetooth (to be implemented) and demonstrates its interaction via a Figma prototype, as shown in Figure 3.2.

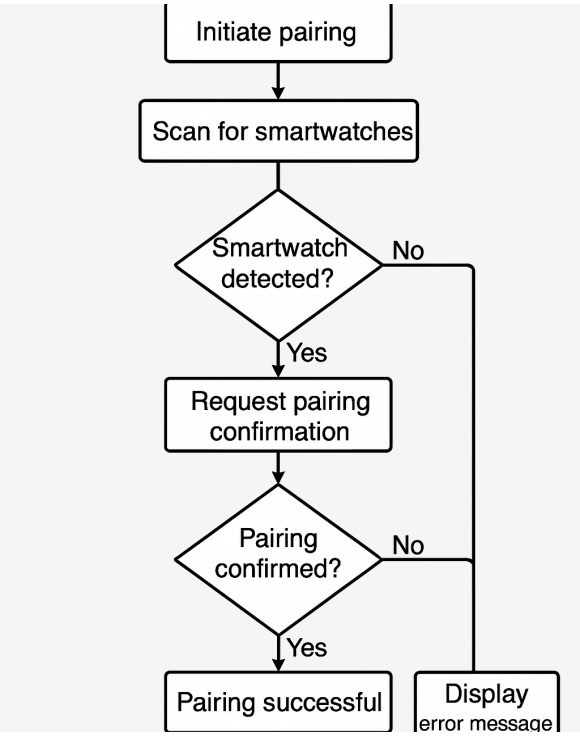


Figure 3.2: Smartwatch Pairing

B. Server-Side Components:

- Firebase Authentication- Handles secure login and registration via email/password.
- Supabase Backend- Manages incident reports, user data, and location-based data analytics.
- Messaging & Notification (React Native Phone Call & SMS)- Sends SOS alerts to emergency contacts through SMS.
- AI Safety Logic- Processes crowd-sourced incident data and computes safe call scores, incorporating Dijkstra's shortest path algorithm.

3.1.2 Functionality

1. User Registration/Login

SafeCircle uses Firebase Authentication to securely handle user registration and login processes, allowing users to create accounts with email and password and access the app with protected credentials.

2. Emergency SOS Trigger

The SOS button can be triggered via the mobile application or the smartwatch interface (demonstrated through a Figma prototype). When activated, it immediately sends a distress message along with the user's real-time location to their pre-saved emergency contacts via SMS and in-app notifications.

3. Fake Call Simulation

The app includes a fake call feature that simulates an incoming phone call, enabling users to discreetly escape potentially harmful or uncomfortable situations by pretending to engage in a real call.

4. Panic Alarm

This feature allows users to trigger a loud siren or alarm sound from their device to attract attention from nearby individuals and deter possible threats or assailants.

5. Incident Reporting

Users can submit reports about suspicious activities, threats, or incidents directly through a form in the app. These reports are stored in the backend and are later used for data analysis and AI-based safety predictions

6. AI-based Safe Call Recommendation

The app leverages AI to provide smart safety recommendations based on incident data. It uses a combination of safety scores (60%) derived from recent reports and Dijkstra's shortest path algorithm (40%) to suggest the safest contact to call or the safest route to follow.

7. User Profile & Settings

Users can view and update their profile details, including their name, phone number, and other personal information. The settings section also includes configurations for emergency contacts, fake call behavior, and smartwatch pairing options.

3.1.3 Additional Considerations

- Smartwatch Integration: Demonstrated via Figma prototype, allowing smartwatch users to trigger SOS alerts.

- Accessibility Features: Large buttons, voice assistance options, and intuitive design for emergency scenarios.
- Security and Privacy: Allows secure authentication, encrypted data storage, and anonymous incident sharing.
- User Training & Feedback: Onboarding text tutorial and feedback loop for improving AI accuracy and user experience.

3.1.4 Summary

SafeCircle's architecture ensures a robust, scalable, and user-friendly personal safety application. By integrating AI, real-time alerts, and emergency features in both mobile and wearable formats, the app provides holistic protection, empowering users with quick and intelligent.

3.2 Architectural Design

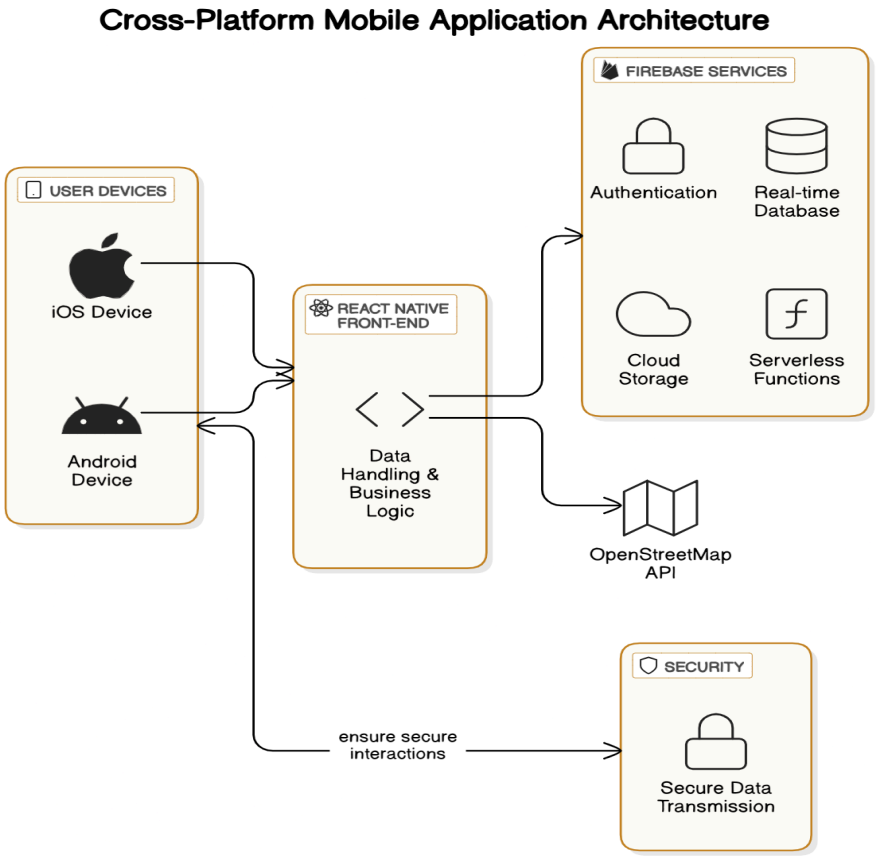


Figure 3.3: System Overview

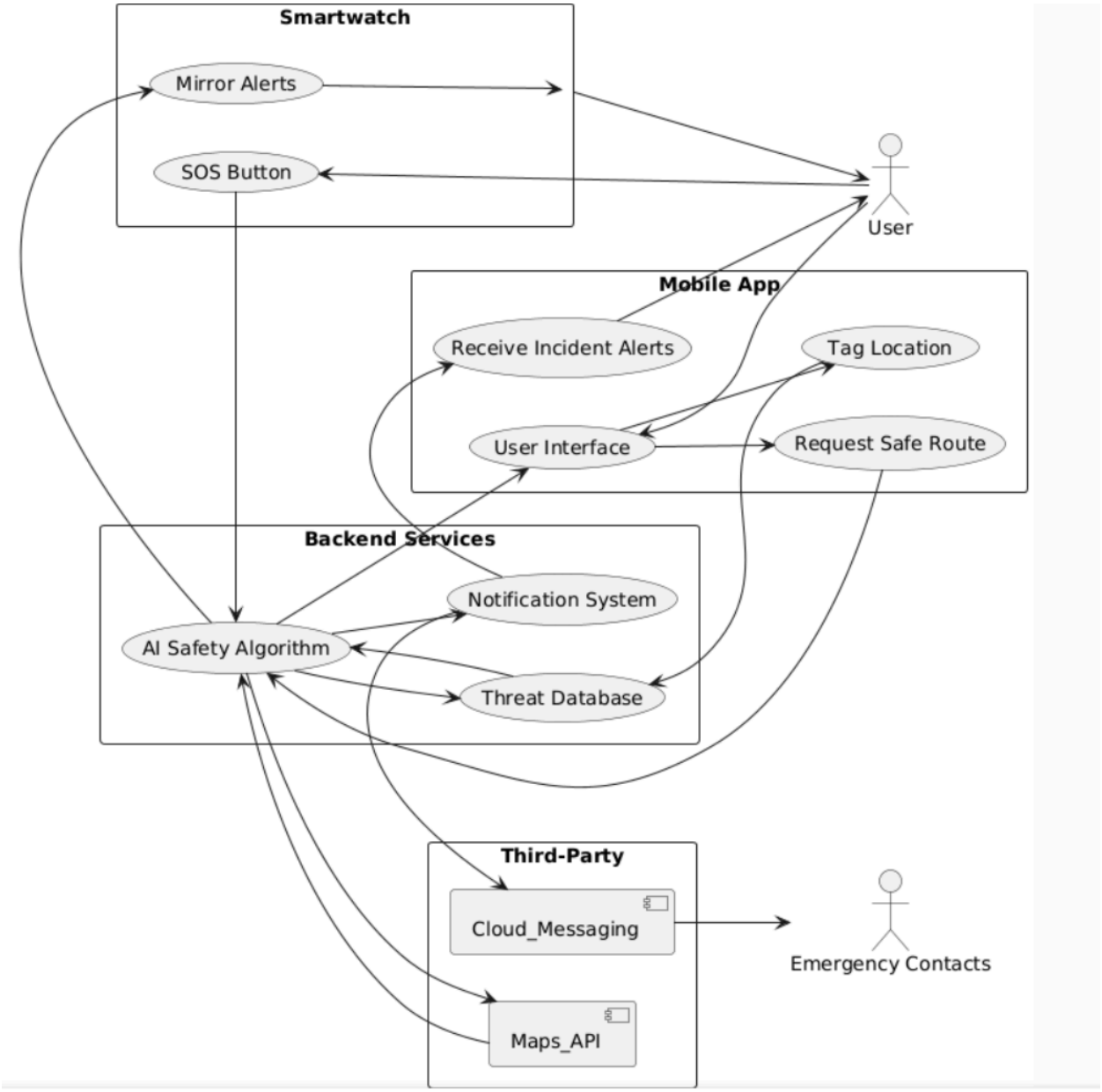


Figure 3.4: Use Case diagram for SafeCircle

The architectural design of SafeCircle adopts a modular client-server model, with a React Native (Expo) frontend and Firebase/Supabase backend. The app manages core functions like login, SOS alerts, incident reporting, and safe route suggestions, while Supabase handles authentication, storage, and real-time sync. Smartwatch integration enables discreet SOS activation. The use case diagram outlines interactions between users, third parties and backend services, as shown in Figure 3.4. The SOS sequence diagram depicts the flow from user alert to backend location update and emergency notifications, as shown in Figure 3.5. These models demonstrate SafeCircle's safety-focused design.

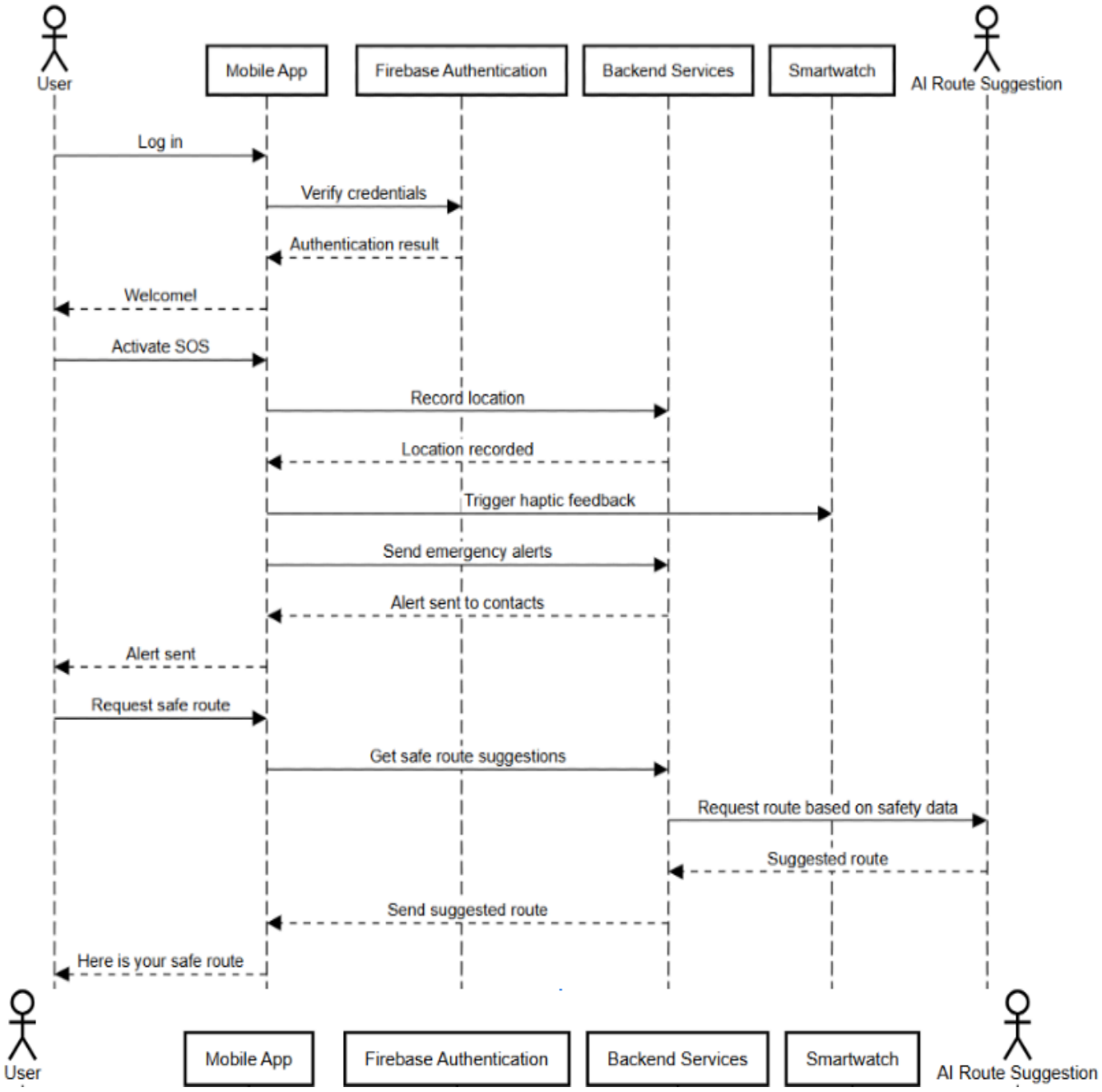


Figure 3.5: Sequence Diagram

3.3 Proposed Methodology/Algorithms

This section details the core algorithms and methodologies implemented in SafeCircle to enhance women's safety using mobile and smartwatch-based emergency features.

3.3.1 SOS Activation Algorithm

- The SOS Algorithm ensures quick communication with emergency contacts along with real-time location sharing.

Input: SOS trigger event (mobile or smartwatch(prototype))
Output: Emergency alerts and location sharing

Method:
Step 1. Monitor for SOS trigger events from UI or wearable devices.
Step 2. Upon detection:
Step 2.1. Acquire current GPS coordinates using device location services.
Step 2.2. Fetch user's pre-configured emergency contact list from the Supabase backend.
Step 2.3. Compose and dispatch SMS to all contacts including:
a. Predefined distress message
b. Real-time latitude and longitude (location link or map coordinates)
2.4. Create and log a new incident in the backend with:
a. User ID
b. Timestamp
c. Location data
d. SOS event metadata
Step 3. Terminate the operation after successful dispatch and logging.

3.3.2 AI-Based Safe Route Recommendation Algorithm

- This algorithm recommends safe route actions based on recent incident reports and location-based safety scores.

Input: User's current location and destination
Output: Safe route path recommendation

Method:
Step 1. Fetch incident data and region-wise metadata from Supabase.
Step 2. Compute a normalized safety score for each region:
a. Based on frequency and severity of incidents (weight = 60%)
Step 3. Construct a directed weighted graph of possible routes:

b. Edge weights incorporate distance and inverted safety score (weight = 40%)
Step 4. Apply Dijkstra's Algorithm to compute the optimal (safest) path.
Step 5. Identify and highlight nearby safest point-of-interest or contacts.
Step 6. Visualize the recommended path overlaying on the OpenStreetMaps.

3.3.3 Fake Call Simulation Algorithm

- This simulates an incoming call for discreet exits from unsafe situations.

Input: User-configured fake call settings
Output: Simulated call interface

Method:
Step 1. Accept user configurations for:
a. Delay time
b. Fake caller name
c. Custom ringtone
d. Optional fake voice recording
Step 2. On fake call activation:
Step 2.1. Start countdown timer with user-defined delay
Step 2.2. Launch fake call UI after timer completion
Step 2.3. Play selected ringtone and show fake caller ID
Step 2.4. Optionally, play recorded audio to simulate a real conversation
Step 3. Provide a user option to end or dismiss the fake call.

3.3.4 Panic Alarm Algorithm

- Triggers a loud siren to draw attention from nearby people in emergencies.

Input: Panic Alarm button press
Output: Audible siren and vibration feedback

Method:
Step 1. Monitor Panic Alarm button state.

Step 2. On activation:
Step 2.1. Set system volume to maximum
Step 2.2. Play siren audio file in a loop
Step 2.3. Activate vibration motor with periodic intervals
Step 3. Auto-stop alarm after a pre-defined timeout (e.g., 60 seconds) or manual cancellation by the user.

3.3.5 Incident Reporting Algorithm

- Allows users to report incidents with details that are stored and analyzed.

Input: User-submitted form data
Output: Database entry for incident

Method:
Step 1. Display incident reporting form with fields:
a. Type of incident (dropdown)
b. Location (auto-detect with manual override)
c. Description
d. Severity level (slider or dropdown)
Step 2. On form submission:
Step 2.1. Validate input fields
Step 2.2. Generate a structured incident object
Step 2.3. Transmit object to Supabase for storage
Step 3. Update local safety score calculations based on new data
Step 4. Notify relevant modules (e.g., map, route engine) of new incident

3.3.6 Smartwatch Pairing Algorithm (Prototype Level)

- Used in the Figma prototype to conceptualize smartwatch-based SOS triggering.

Input: User interaction in smartwatch pairing settings
Output: Linked smartwatch interface with SOS control

Method:
Step 1. In the settings module:
Step 1.1. Trigger Bluetooth scan for available smartwatch devices

(simulated)

Step 1.2. Display available devices and allow user to select

Step 1.3. Show mock “Paired” status after selection

Step 2. Mirror the SOS button in smartwatch UI

Step 3. When smartwatch SOS is triggered:

Step 3.1. Relay event to the mobile app

Step 3.2. Execute the same SOS Activation Algorithm logic (Algorithm 1)

3.4 User Interface Design

3.4.1 Home Screen

The home screen serves as the central hub of the SafeCircle app, designed to provide users with quick access to vital safety features. With a clean and intuitive layout, it prioritizes usability during emergencies. The design includes a large red SOS button at the top-center for instant emergency alert activation. Surrounding it are other essential safety features including Panic Alarm, Fake Call, Safe Route, and Report Incident, all easily tappable for swift actions.

A hamburger menu icon in the top-right corner expands to reveal additional options such as Settings, Profile, Logout, and Google Account integration. Below the emergency controls is a section titled Incident Reports, where recently reported incidents are listed with location and date, helping users stay informed about nearby dangers. The screen maintains a soft lavender and pink theme, aligning with SafeCircle's visual identity.

Additionally, users can tap on incident entries to view their locations on an interactive map, with options to explore surrounding reports. The design is responsive and optimized for quick navigation, ensuring users can act decisively even in high-stress situations..

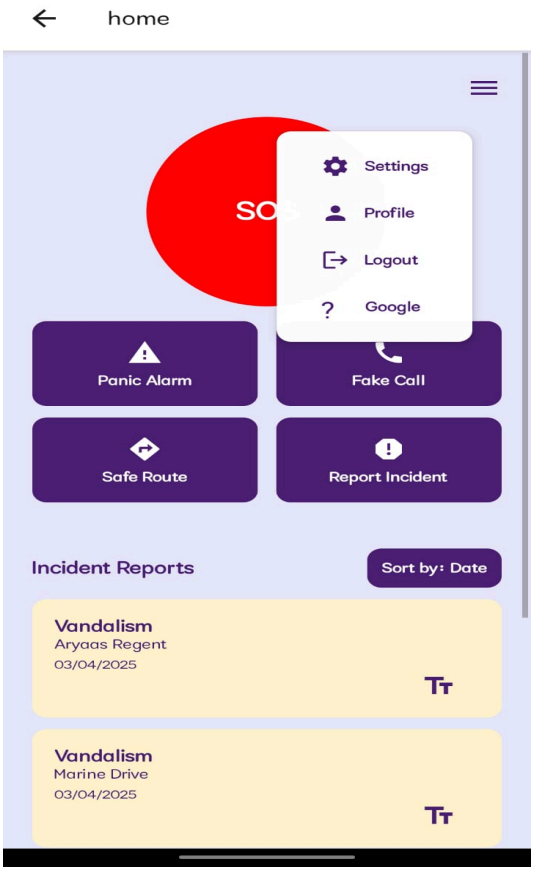


Figure 3.6: Home Screen Wireframe

3.4.2 Trigger Emergency Alert

This wireframe exemplifies how the SOS feature is made highly accessible. The large red circular SOS button dominates the upper section of the screen, allowing users to immediately send emergency alerts with a single tap. Its strategic placement ensures it's easily identifiable in stressful moments.

3.4.3 Alert Confirmation

Although not visible in this specific wireframe, once the SOS button is tapped, users are taken to an Alert Confirmation screen. This intermediate step prevents accidental alerts and gives the user a chance to confirm or cancel. The screen also outlines the type of emergency and shows the recipients (emergency contacts) who will be notified, maintaining transparency and control over the emergency response process.

3.4.4 Settings

The Settings option in the dropdown menu leads to a screen where users can personalize their experience. Here, users can:

- Configure fake call timing and sound
- Add or remove emergency contacts
- Adjust notification preferences
- Pair their smartwatch for SOS triggers
- Toggle voice activation options

The design of this section follows the app's theme with user-friendly icons and clear labels, ensuring accessibility for users of all ages.

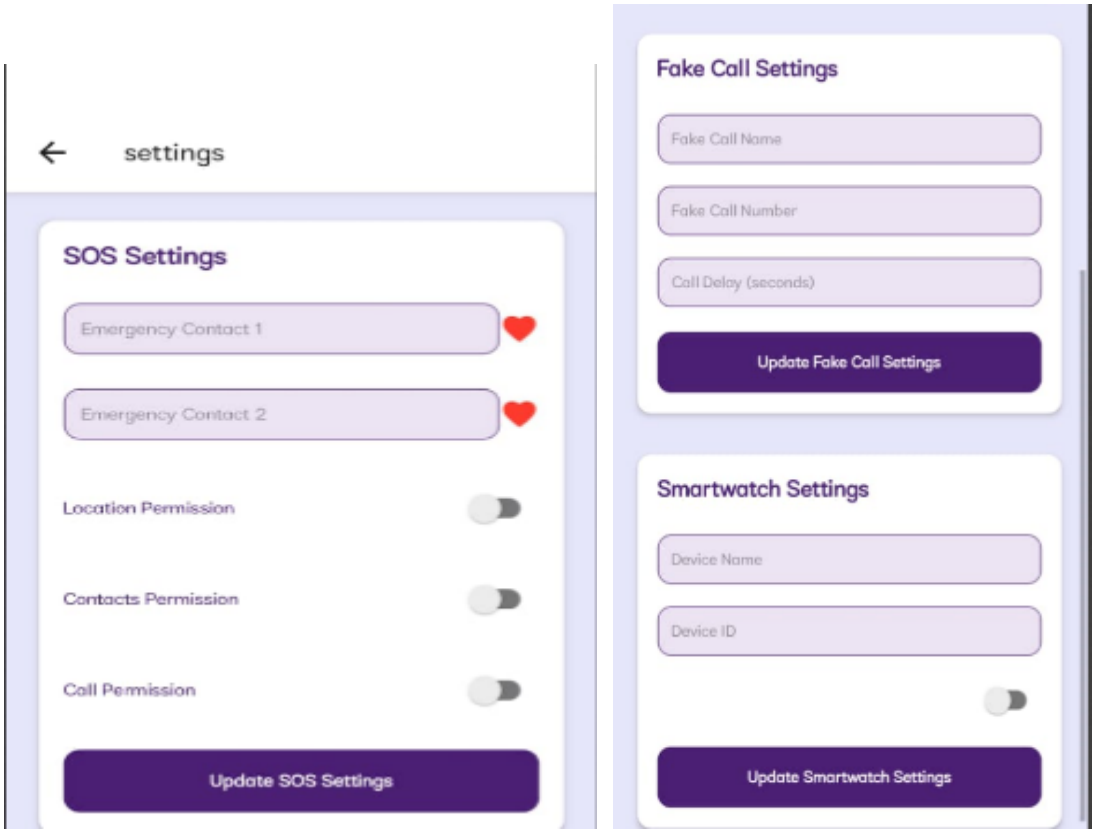


Figure 3.7: Settings Wireframe

3.4.5 Contact Selection

While contact selection isn't shown directly on the home screen, it is accessible via the Settings section (opened from the hamburger menu). There, users can manage and customize their emergency contact list. The feature allows adding new contacts, organizing them into groups, or selecting specific individuals to receive alerts. This

customization ensures users can tailor the alert system to their unique support network.

3.4.6 Recent Alerts

At the bottom of the home screen, the Incident Reports section displays recently reported safety issues, helping users stay aware of risks in their area. Each report card includes:

- Type of incident (e.g., Vandalism)
- Location (e.g., Aryaas Regent, Marine Drive)
- Date of occurrence
- Severity of Incident

A “Sort by: Date” button allows users to organize the reports chronologically. Tapping an incident will provide more details, such as user comments or actions taken. This feature enhances transparency and promotes informed decision-making while traveling.

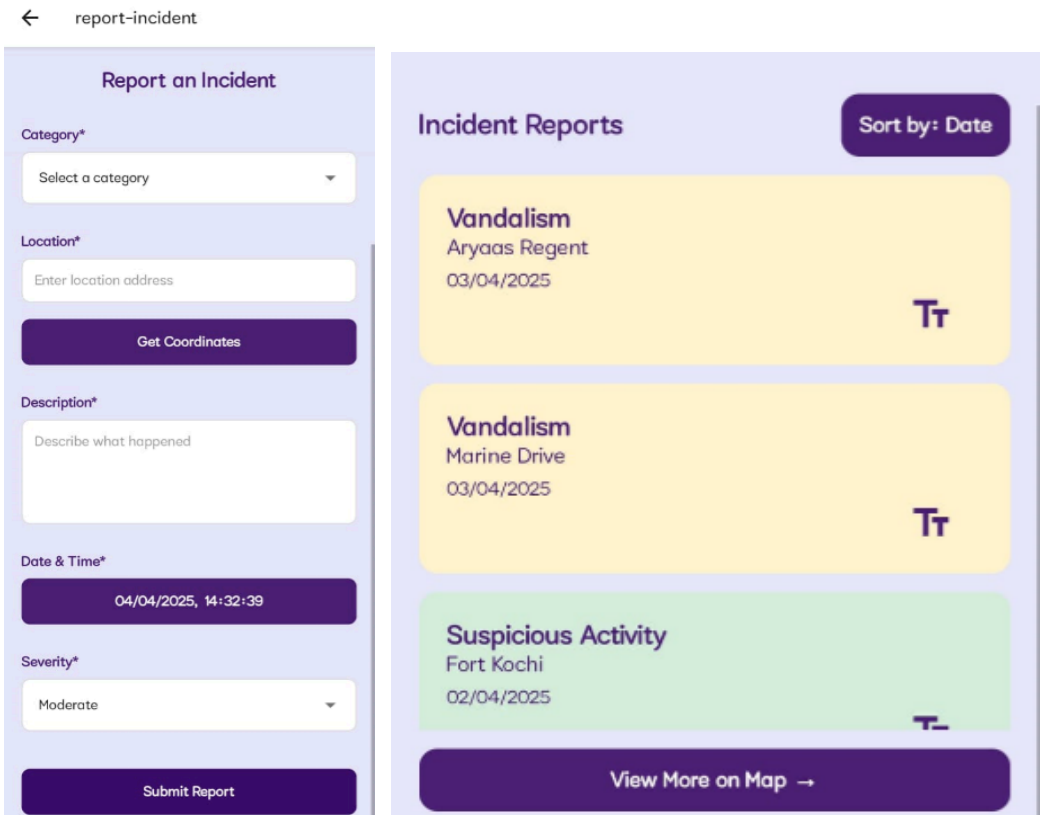


Figure 3.8: Incident Reports Wireframe

3.5 Description of Implementation Strategies

3.5.1 AI-Based Safe Route Suggestion

A.Library/Tech Stack: Custom AI model (backend), React Native frontend, GPS

integration

B. Explanation: The app recommends routes using a hybrid AI model that considers both safety and shortest distance. The route generation strategy is composed of:

- 60% weightage on Safety Score: Based on historical incident data, user-submitted reports, and feedback.
- 40% weightage on Dijkstra's Algorithm: For computing the shortest path between the origin and destination.

C. Working:

- The AI model is trained to adapt based on user behavior and incident trends.
- Routes are ranked and recommended to users accordingly.
- The system will be enhanced in future using Reinforcement Learning based on user feedback.

3.5.2 GPS Integration

A. Library: expo-location (React Native)

B. Explanation: GPS is used to fetch real-time user location during SOS triggers, incident reporting, and safe route generation. This ensures accurate alerting and routing.

C. Method:

```
import * as Location from 'expo-location';

const getLocation = async () => {
  let { status } = await Location.requestForegroundPermissionsAsync();
  if (status !== 'granted') {
    Alert.alert('Permission to access location was denied');
    return;
  }

  let location = await Location.getCurrentPositionAsync({});
  console.log("Lat:", location.coords.latitude, "Lng:", location.coords.longitude);
};
```

3.5.3 Alert Messaging

A. Library: react-native-sms and react-native-phone-call

B. Explanation: SafeCircle uses native phone call and SMS functionalities to contact the user's emergency contact directly when the SOS button is triggered. This is done without

third-party services like Twilio, ensuring faster response and offline compatibility (as long as the user has signal).When the SOS is activated, the app :

- Calls the emergency contact.
- Sends an SMS with the user's real-time location and a predefined help message.

3.5.4 Fake Call Simulation

A. Model Used: State Machine Model

B. Explanation: The fake call feature mimics an incoming call to help users escape dangerous situations. It is implemented using a state machine model to handle transitions such as:

- Idle → Delay Timer → Incoming Call → Call Ended

Users can configure delay time and ringtone type in the settings tab. The fake call appears realistic with caller name, sound, and vibration to simulate a genuine phone call.

3.5.5 Incident Reporting

A. Tech Stack: React Native + Supabase

B. Explanation: Users can submit reports of incidents like harassment, theft, etc., through a structured form. These are stored in Supabase and used to update safety scores in the AI safe route model.

C. Features:

- Upload optional images
- Select incident type and location
- View all submitted incidents in a sorted list by date

3.5.6 SOS & Panic Alarm

A. SOS Trigger Methods:

- Home Screen: Via a large circular red button
- Smartwatch: Triggered through wearable interface (Figma prototype)

B. Explanation: Upon triggering, the SOS feature:

- Sends SMS to emergency contacts
- Shares real-time location
- Triggers panic alarm if needed

- Optionally notifies nearby users (feature to be expanded in future updates)

3.5.7 User Authentication

A. Backend: Supabase Auth

B. Explanation: Users can register/login using email and password. On first login, they are prompted to complete their profile with:

- Name
- Emergency contact number
- Profile picture

3.5.8 Settings and Personalization

A. Available Settings:

- Emergency Contacts: Add/remove/edit contacts
- Fake Call Settings: Configure ringtone, delay, and caller ID
- Smartwatch Pairing: Placeholder shown via Figma prototype
- User Profile: View/update profile details and preferences

3.6 Module Division

- Module 1 : UI Development

  This module involves responsibilities like developing React Native UI screens for Login page, Home page, SOS Button, Settings, Profile page etc. Includes handling user location updates and shows the AI safety recommendations.

- Module 2 : Back End Development

  This module involves responsibilities like fetching route data from Google Maps, handling SOS alerts, sending real time updates to the emergency contact list, handling push notification triggers. Back end also involves coordinating communication between client, AI, and database.

- Module 3 : AI/ML Development

  This module involves responsibilities like training and fine-tuning the route safety classification model. The ML Development involves phases like preprocessing route data, optimizing prediction performance and accuracy and integration of the

model with the back end.

- Module 4 : Simulation of Smart Watch Integration

  This module involves responsibilities like creating the graphical user interface for the smartwatch simulation. This also involves integration of the Google Maps API into the application, also involves managing database information.

3.7 Work Division - Gantt Chart

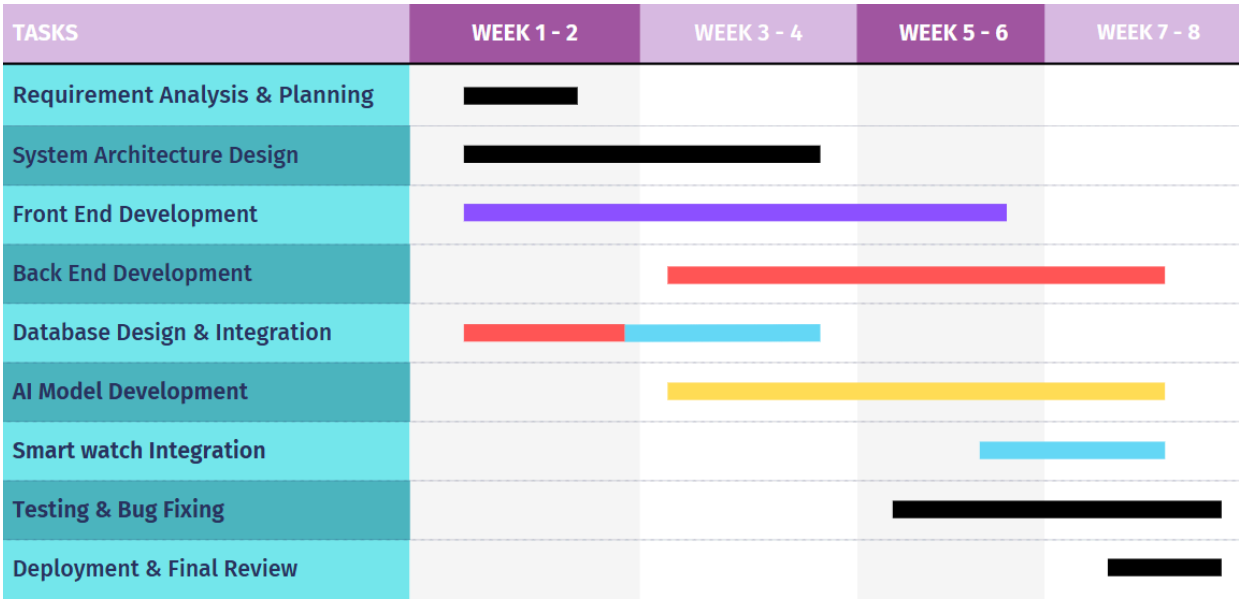


Figure 3.9: Gantt Chart

3.8 Summary

3.8.1 User Interface Design

The Home Screen is the main landing interface that the user interacts with after logging in. It provides instant access to core safety functionalities like SOS alerts, panic features, fake calls, and real-time route safety, while also keeping users informed of nearby reported incidents.

A. SOS button: A large, visually striking SOS button in red—highly visible to trigger emergency help immediately.

B. Fake Call: Upon tapping “Fake Call,” a pop-up notifies users that a fake call will start in 10 seconds. The simulated incoming call screen mimics a real call UI, showing the

user’s preferred name of caller with Decline and Answer buttons.

C. Safe Route Feature: Prompts users to enter the source and destination.Once both fields are filled, pressing "Find Safe Route" uses the trained AI model to suggest the safest path based on safety scores. Provides a clear UI with ‘Cancel’ and ‘Find Safe Route’ buttons.

D. Report Incident: Displays a Category Dropdown which includes selecting type (e.g., Vandalism, Suspicious Activity), Location Field, Get Coordinates, Description, Date & Time, Severity. Finally a Success Popup message confirms that the incident has been reported successfully. The map screen would show reported locations on the map. Red Pin indicates unsafe areas. Green Pin indicates safer route or endpoint.

E. Settings:

- SOS Settings: Enter two Emergency Contacts, toggle permissions for Location, Contacts, and Call Access, button to update all SOS settings.
- Fake Call Settings: Customize Fake Caller Name, Number, and Delay (in seconds), update settings via a dedicated button.
- Smartwatch Settings: Pair a device using Device Name and Device ID, toggling Bluetooth-like options is possible. Enables smartwatch integration for haptic alerts and emergency functions.

F. Profile Page: displays User Name and Email, Edit Profile button for modifying details, App Usage (e.g., number of visits), Feedback Section to allow users to write suggestions or issues about the application.

G. Incident Reports: with a Sort by: Date,severity filter on the top-right. Each incident is displayed in a card layout, containing Type of incident (e.g., Vandalism), Location, Date.

3.8.2 Description of Implementation Strategies

- AI-Based Safe Route Suggestion
  Routes are recommended using a hybrid model prioritizing safety (60%) and shortest distance (40%). The AI adapts to incident trends and user feedback for future improvements.
- GPS Integration
  Real-time location is fetched using expo-location for SOS, routing, and incident reporting. It ensures accurate alerts and location-based services.
- Alert Messaging

Twilio SMS API sends emergency messages with user location to contacts during SOS. It ensures fast, automated alert delivery during crises.

- Fake Call Simulation
  Simulated calls are handled via a state machine to mimic realistic incoming calls. Users can customize ringtone, delay, and caller details for authenticity.
- Incident Reporting
  Users can report incidents with details and images via a form saved in Supabase. These reports contribute to updating area safety scores.
- SOS & Panic Alarm
  SOS can be triggered from the app or smartwatch, sending alerts, location, and activating a loud alarm. Future updates will notify nearby users.
- User Authentication
  Supabase handles secure email-password login, prompting users to complete profiles. Personal data like name and emergency contacts are stored securely.
- Settings and Personalization
  Users can manage emergency contacts, fake call preferences, and profile details. A smartwatch pairing option is displayed via a prototype.

3.8.3 Module Division

1. UI Development
2. Backend Development
3. AI/ML Development
4. Simulation of Smartwatch Integration

3.8.4 Work Schedule - Gantt Chart

Provides a Gantt chart illustrating the project timeline and milestones.

CHAPTER 4

RESULTS & DISCUSSIONS

4.1 Overview

SafeCircle is a personal safety companion app designed to enhance individual security through real-time emergency features, AI-driven navigation, and community-based reporting. Developed with a focus on vulnerable groups such as women and children, the app uses advanced technologies like artificial intelligence and geolocation to deliver timely assistance and safety insights in both urban and rural areas.

The app's Emergency Alerts feature allows users to send instant SOS notifications to their designated contacts, complete with real-time location coordinates. These alerts can be triggered via both smartphones and smartwatches, enabling quick responses even when the phone isn't easily accessible.

AI-Powered Route Safety helps users navigate smarter by offering safe route suggestions based on dynamic safety scores. These scores are calculated from various factors including crime rates, street lighting, traffic patterns, and proximity to key public infrastructure like police stations and hospitals. This ensures users avoid high-risk areas during travel.

Through its Community Features, SafeCircle encourages users to actively report safety-related incidents and share feedback. This builds a community-sourced safety map, keeping users informed about local threats through real-time alerts and fostering a culture of shared vigilance.

Additionally, Smartwatch Integration ensures accessibility by allowing users to interact with the app hands-free. Whether it's triggering an alert or receiving important safety notifications, users can rely on their wearable devices for discreet and convenient access to key functions.

SafeCircle is not just an emergency app but it's a trusted safety companion that empowers users to make informed decisions, seek help when needed, and contribute to a safer community.

4.2 Testing

1. The Safe Route Suggestion feature helps users navigate securely by recommending the safest path between two locations. Users input their source and destination, after which the app assigns safety scores to regions based on incident frequency (60% weight) and applies Dijkstra's algorithm using safety scores as edge weights (40% weight) to compute the safest route.The final route is displayed on a map, with green segments representing highly safe areas (comparatively the shortest path as well) and blue segments indicating moderately safe paths, helping users visually distinguish levels of safety along the route, as shown in Figure 4.1 .

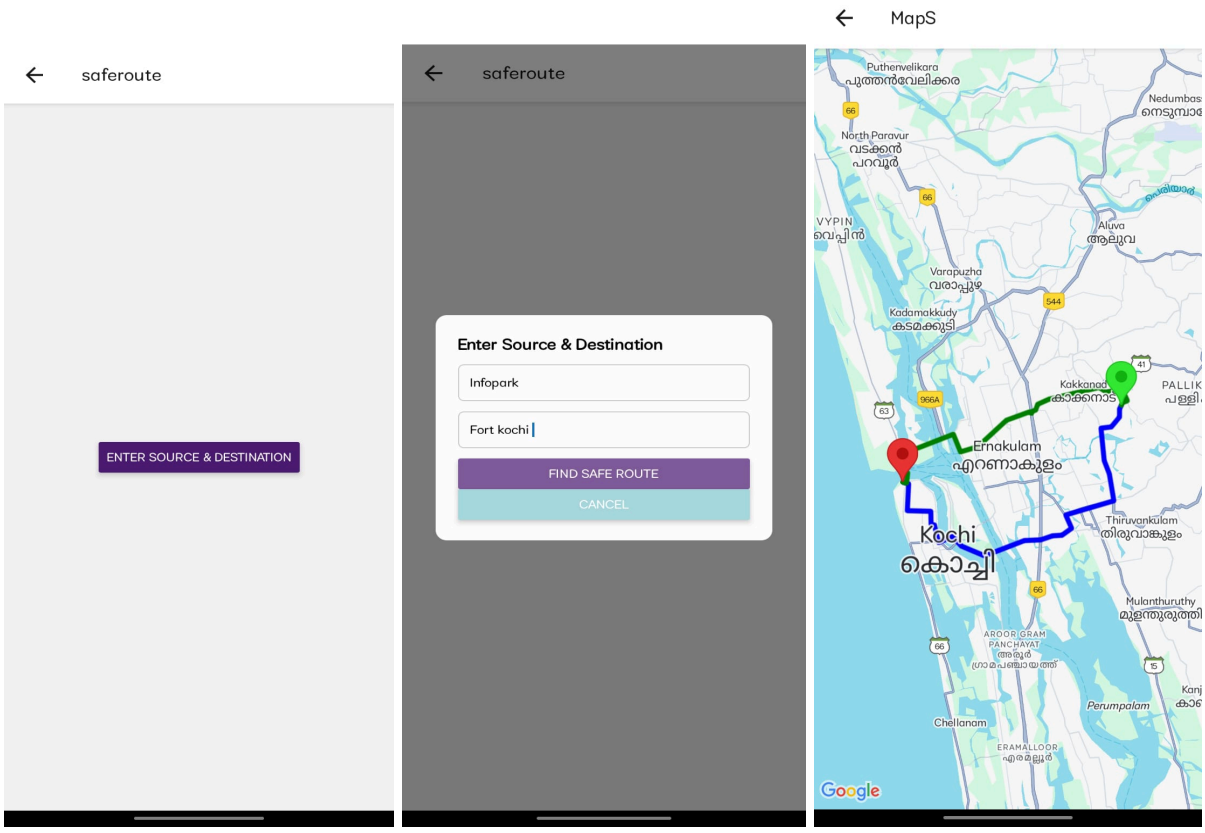


Figure 4.1: Safe Route Suggestion Feature

2. The incident reporting feature allows users to report safety-related incidents such as vandalism or suspicious activity. The interface includes fields for selecting a category, entering the location of incident (with an option to get coordinates), providing a description, specifying date & time of occurrence of the incident, and setting severity of the incident.The user can also view the recent incident listings (e.g., vandalism on "Mentre Drive") on the home screen along with a map displaying incident marker pins and the user's current location. Red Pin indicates unsafe areas. Green Pin indicates safer route or endpoint and the Blue Pin indicates the user's current location, as shown in Figure 4.2.

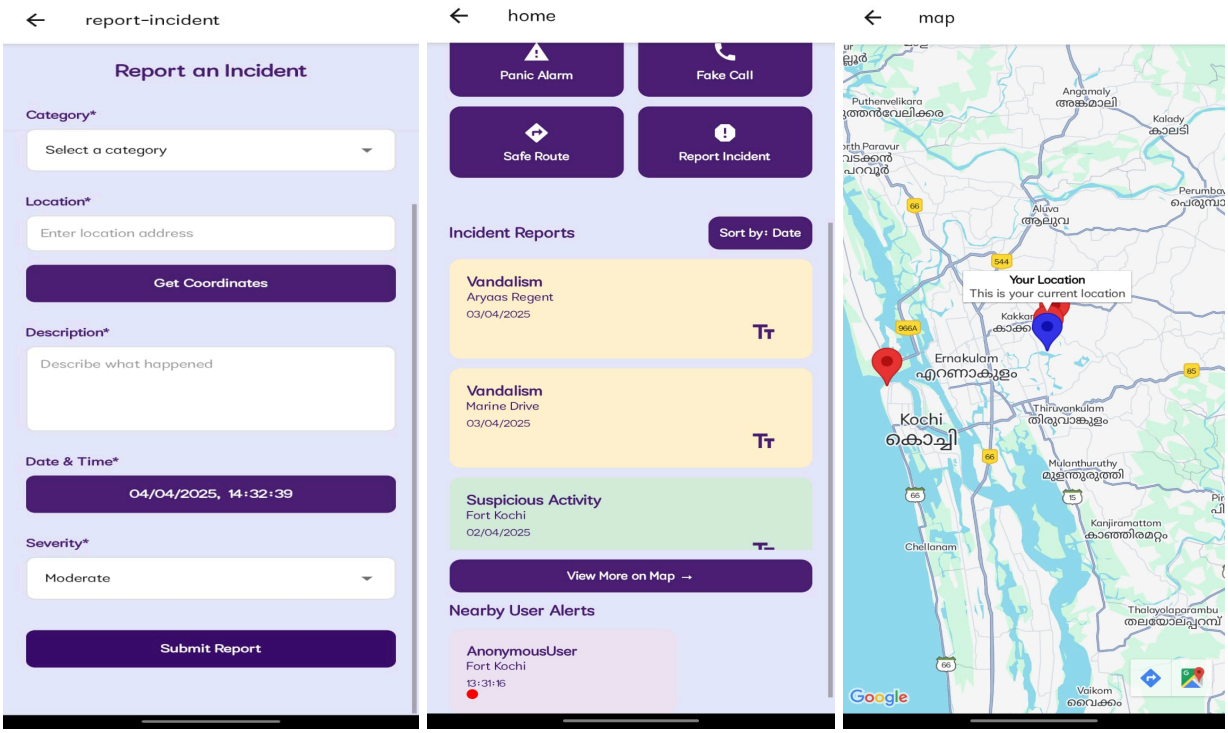


Figure 4.2 : Incident Reporting Feature

3. The Panic Alarm feature is designed for emergency situations, allowing users to quickly trigger a distress signal by clicking on the Panic Alarm button in the home screen, as shown in Figure 4.3. When the button is activated, the screen displays a prominent "Panic Alarm has been triggered" alert, along with actionable options like Turn Off Alarm which silences the alarm if the threat has passed.

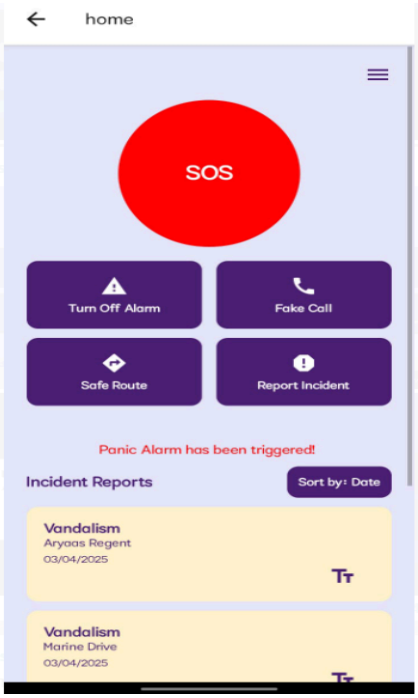


Figure 4.3 : Panic Alarm Feature

4. The SOS Activation and Configuration feature is designed as a rapid emergency response tool that, when activated, immediately sends SMS alerts containing the user's real-time location to their predefined contact list. The system prioritizes notifications by first messaging the contacts marked with a heart in the settings indicating the user's most trusted or preferred responders, ensuring critical help is alerted without delay. This tiered approach guarantees that the most important contacts are notified first, while the clear on-screen "SOS Activated" confirmation provides visual reassurance that the distress signal has been initiated, as shown in Figure 4.4.

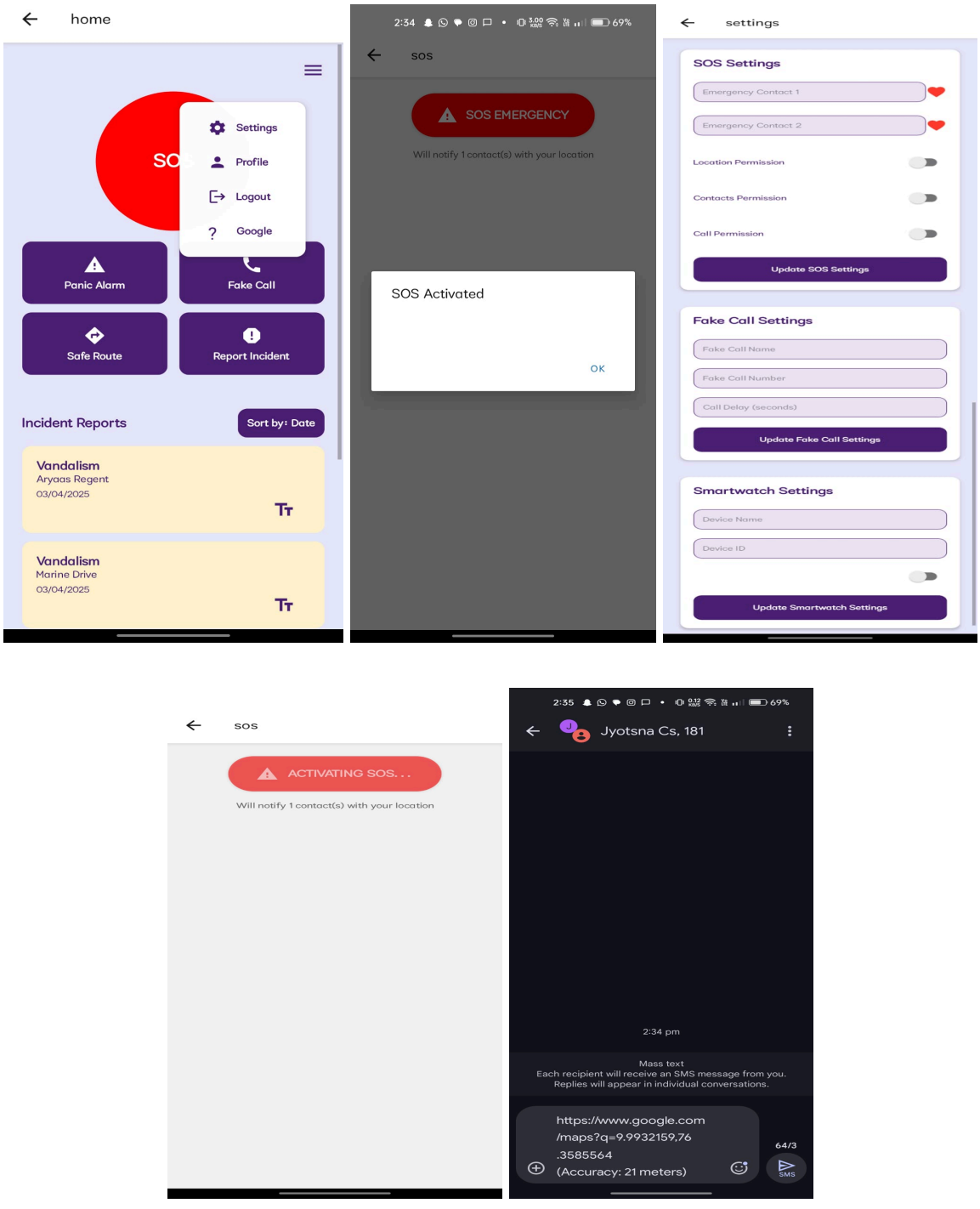
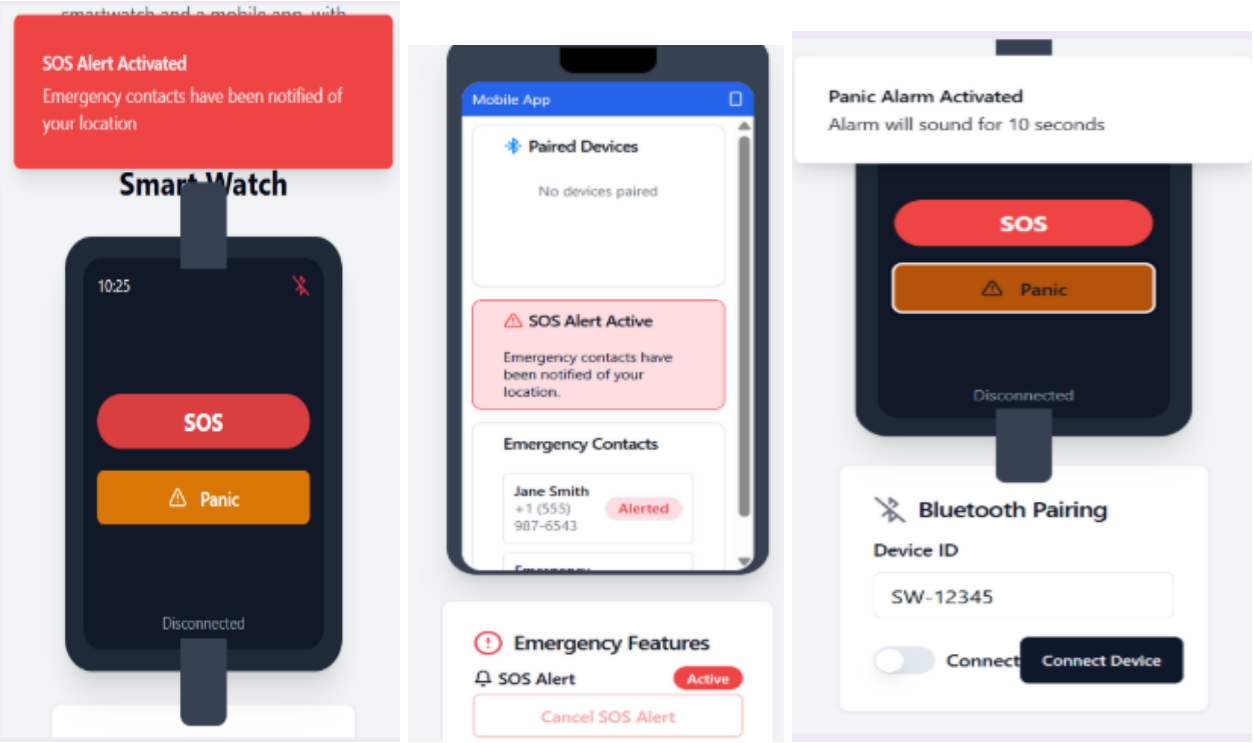


Figure 4.4 : SOS Activation and Configuration Feature

5. With respect to the smartwatch functionality, when the SOS Alert is activated on the smartwatch, the system immediately notifies all designated emergency contacts (e.g., Jane Smith +1 (555) 987-6543) via SMS, sharing the user's real-time location. A confirmation message appears on both the smartwatch ("SOS Alert Active") and mobile app, ensuring visibility. The app also provides options to cancel the SOS alert or manage emergency features. The Panic Alarm triggers a loud alarm to deter threats or attract attention, with status displayed on the smartwatch and app, as shown in Figure 4.5. For device pairing, the app supports Bluetooth connectivity with smartwatches (e.g., Device ID: SW-12345). If disconnected, the interface prompts reconnection ("Connect Device"), though the "Disconnected" status on the watch limits remote SOS/panic activation. The app lists paired devices and emergency contacts, prioritizing seamless integration for rapid emergency response.



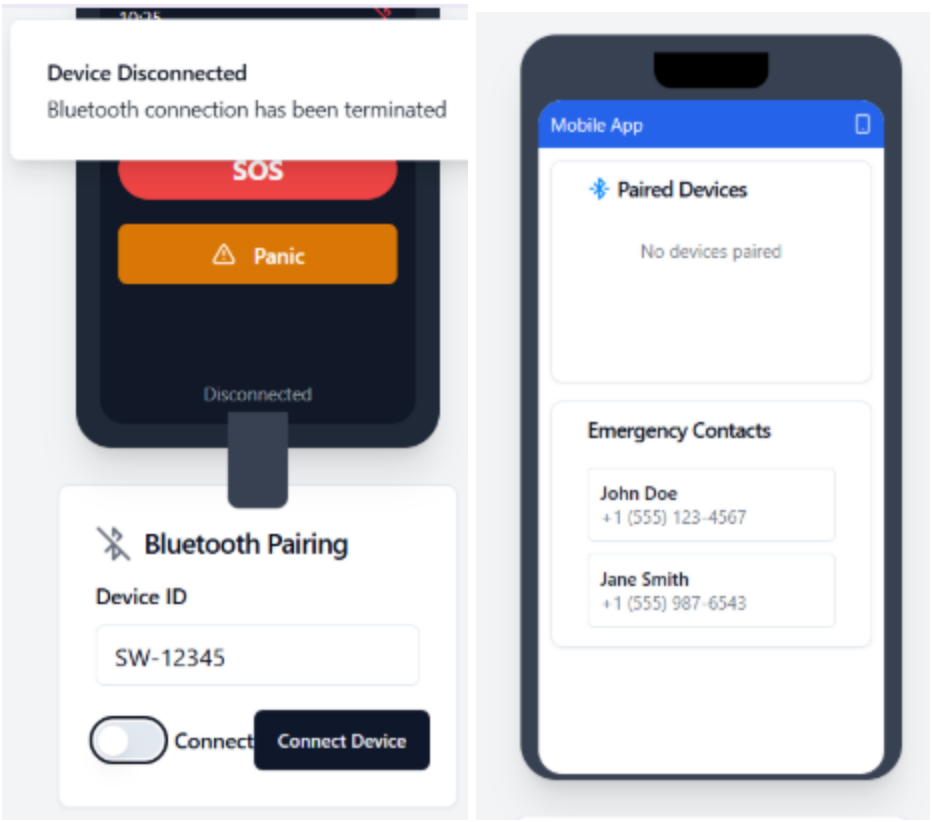


Figure 4.5 : Smartwatch Functionality

6. The Fake Call feature is a discreet safety tool designed to help users quickly exit uncomfortable or threatening situations. When activated, the app simulates an incoming phone call within a set time (e.g., "Fake call is scheduled in 10 seconds"). The call appears realistic, displaying a generic caller ID with options to Decline or Answer, mimicking an actual phone call interface, as shown in figure 4.6. This allows users to pretend they're receiving an urgent call, providing a plausible excuse to leave an unsafe environment or deter potential threats.

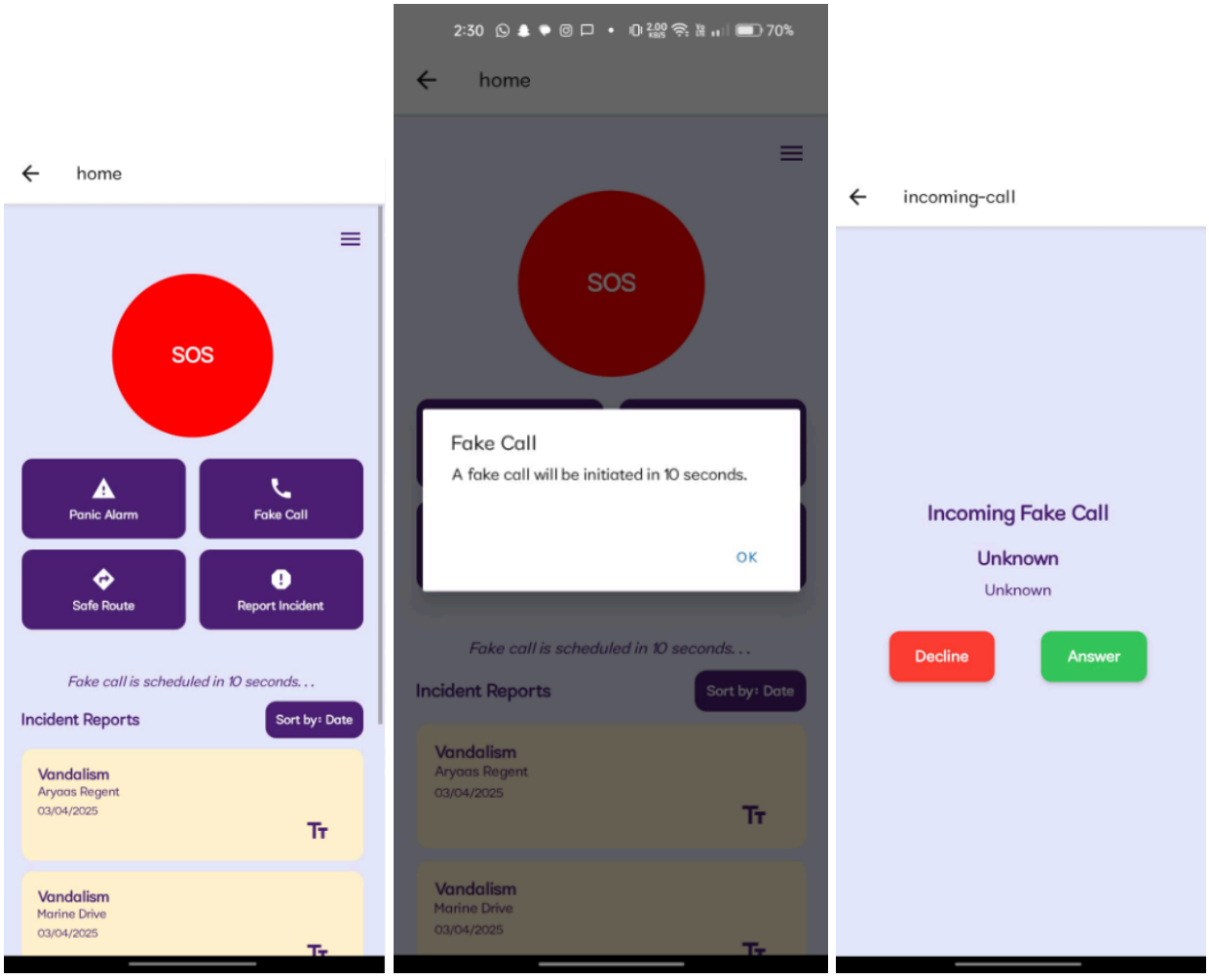


Figure 4.6 : Fake Call Feature

The app underwent rigorous testing to validate its performance:

- UI Screenshots: Demonstrated intuitive interfaces for incident reporting, SOS activation, and route navigation, as shown in Figures 4.1–4.4 and Figure 4.6.
- Feature Validation: Confirmed functionality of panic alarms, fake calls, and real-time location sharing.
- Smartwatch Compatibility: Verified Bluetooth pairing and emergency trigger mechanisms, as shown in Figure 4.5.

4.3 Quantitative Results

- Model Accuracy: Achieved 95.7% in safety score predictions (see Confusion Matrix and Classification Report).
- Geolocation Metrics: Location Accuracy is 10 meters.Average Response Time is 5 seconds for SOS alerts.
- Safety Score Parameters: Incorporated 18 weighted factors (e.g., police station proximity, CCTV presence, crime rates).

4.4 Discussion

The results highlight SafeCircle's effectiveness in merging technology with safety solutions:

- AI Reliability: High accuracy in route safety scoring ensures trustworthy recommendations.
- Community Impact: Incident reporting and shared alerts create a proactive safety network.
- User Empowerment: Features like fake calls and panic alarms provide discreet emergency options.
- Future enhancements (e.g., anomaly detection, automatic recording) could further refine responsiveness.

4.5 Summary

SafeCircle effectively tackles personal safety concerns by integrating advanced technologies such as AI-powered navigation, real-time emergency alerts, and a community-driven reporting system. Comprehensive testing validated the app's high performance in critical areas like geolocation accuracy, timely emergency protocol execution, and an intuitive user interface that ensures ease of use. Its modular and scalable architecture supports both current features and future enhancements, making it adaptable

to evolving safety requirements. With planned updates focused on expanding coverage, improving user experience, and refining AI models based on user feedback, SafeCircle is positioned as a dependable and forward-looking companion for personal security in both urban and rural environments

CHAPTER 5

CONCLUSION

5.1 Conclusion

SafeCircle represents a significant advancement in personal safety technology, offering a comprehensive suite of features designed to empower users during emergencies. By integrating AI-driven route recommendations, real-time SOS alerts, panic alarms, and community-based incident reporting, the app addresses critical safety concerns for vulnerable groups such as women and children. The seamless integration with smartwatches and third-party services like Google Maps ensures rapid emergency response and proactive safety measures.

Key achievements include:

- High Model Accuracy (95.7%) for safety score predictions, validated by quantitative testing.
- Community-Driven Safety Network, enabling users to share incident reports and receive localized alerts.
- Cross-Platform Accessibility, supporting Android, iOS, and wearable devices for broad usability.

SafeCircle's focus on user-centric design—such as customizable emergency contacts, fake call functionality, and one-touch SOS—demonstrates its commitment to discretion and efficiency in crises. This project sets a new standard for safety applications by merging cutting-edge technology with practical, life-saving solutions.

5.2 Future Enhancements

- Anomaly Detection for Routes: Deploy AI to monitor real-time changes in route safety (e.g., sudden crime spikes or accidents) and reroute users dynamically.
- Automatic Audio/Video Recording: Initiate recording during SOS activation to capture critical evidence for authorities.
- SafeCircle Social Network: Expand the community features to include trusted networks for route-sharing and SafeCarpooling.
- Smart Home Integration: Enable alerts via IoT devices (e.g., smart speakers) for

additional emergency triggers.

- Multilingual Support: Broaden accessibility to serve diverse linguistic demographics.

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Appendix A : Presentation

SafeCircle

FINAL PRESENTATION

GUIDE
Mr. Biju Abraham N.

TEAM MEMBERS
Kesiya Mariam Reji
Jyotsna Mariam Joji
Eujwal Joshi K
Jose Chemmanoor

03/04/2025

CONTENTS

- Introduction
- Problem Definition
- Objectives
- Scope and Relevance
- System Architecture
- Work Division- Gantt chart
- Software/Hardware requirements
- Results
- Conclusion
- Future Enhancements
- References

INTRODUCTION

- Personal safety has become a critical concern, especially for vulnerable groups like women and children, necessitating real-time safety solutions.
- SafeCircle is a mobile app offering emergency alerts, fake call facility, AI based route suggestions, and incident reporting to enhance personal safety.
- Purpose is to provide users with quick access to emergency assistance and community safety insights for proactive decision-making.
- It empower users to feel safer and more connected during emergencies, leveraging AI and community-driven safety networks.

PROBLEM DEFINITION

To design, develop, and implement SafeCircle, a mobile application offering real-time safety features like SOS emergency alerts, panic alarm feature, to enhance personal safety and emergency response.

OBJECTIVES

1. **Develop Emergency Features:** To implement SOS alerts, incident reporting, for immediate assistance.
2. **AI-Driven Route Navigation:** To provide route suggestion system using AI, based on a safety score generated by a trained model.
3. **Community Awareness:** To foster a safety network by allowing users to report incidents, give feedback, activate & receive SOS alerts in their vicinity.

SCOPE AND RELEVANCE

SCOPE

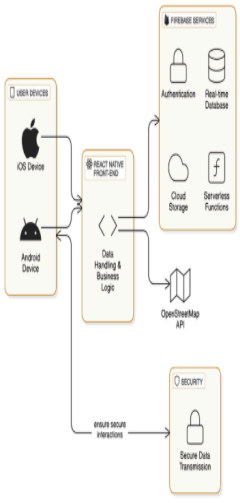
SafeCircle is a personal safety app that empowers users in emergencies and promotes navigation in urban and rural areas. It integrates features like SOS alerts, panic alarms and community-based reporting.

RELEVANCE

SafeCircle addresses critical personal safety concerns by leveraging AI, real-time alerts, and community-driven features to empower vulnerable users and enhance emergency responsiveness in an increasingly unsafe world.

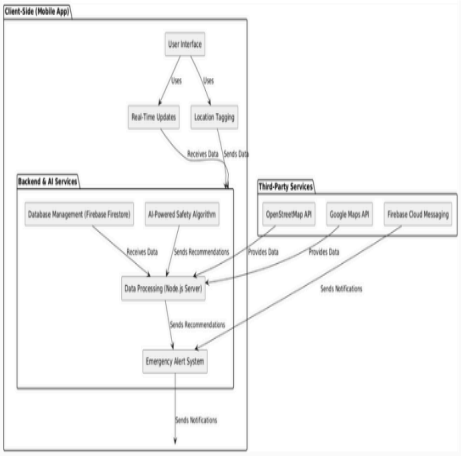
SYSTEM ARCHITECTURE

Cross-Platform Mobile Application Architecture



SYSTEM ARCHITECTURE

USE CASE DIAGRAM



Gantt Chart

TASKS	WEEK 1 - 2	WEEK 3 - 4	WEEK 5 - 6	WEEK 7 - 8
Requirement Analysis & Planning				
System Architecture Design				
Front End Development				
Back End Development				
Database Design & Integration				
AI Model Development				
Smart watch Integration				
Testing & Bug Fixing				
Deployment & Final Review				

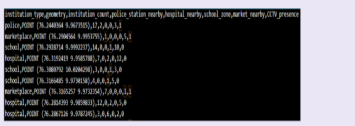
SOFTWARE REQUIREMENTS

BACK-END	FRONT-END	MAP TOOL	AI TOOL
Supabase	React Native	Google Maps API	Google Colab

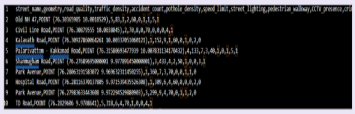
HARDWARE REQUIREMENTS

SMARTPHONE	SMARTWATCH
GPS Camera and Microphone Internet & Bluetooth Connectivity & Notification OS Compatibility of Android 8.0+ or iOS 12+	Bluetooth & Notification Mirroring Physical Button Wear OS or Compatible OS

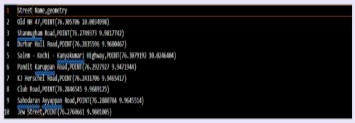
SCREENSHOTS & RESULTS



Dataset1-Institutions



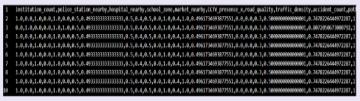
Dataset 2- Road conditions



Dataset 3- Streets Coordinates

SCREENSHOTS & RESULTS

Dataset 4 - Street Lighting Data



Preprocessed Data

SCREENSHOTS & RESULTS

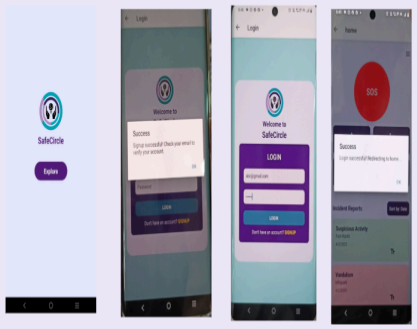
safety_score	safety_label
0.5436790370964855	1
0.5931644233369341	1
0.5723145948709155	1
0.6838215888097123	1
0.4567827922934811	0
0.5723145948709155	1
0.5102929532858274	1
0.4738057534969648	0
0.5579308524676695	1
0.7303378200052784	1
0.5102929532858274	1

```
Model Accuracy: 0.9570

Confusion Matrix:
[[1254   67]
 [  76 1925]]

Classification Report:
              precision    recall  f1-score   support

           0       0.94      0.95      0.95      1321
           1       0.97      0.96      0.96      2001
```

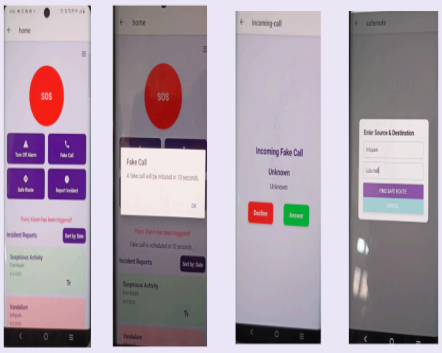
Parameters Used :

- institution_count": 0.1,
- "police_station_nearby": 0.15,
- "hospital_nearby": 0.1,
- "school_zone": 0.05,
- "market_nearby": 0.05,
- "CCTV_presence_x": 0.1,
- "road_quality": 0.1,
- "traffic_density": 0.05,
- "accident_count": -0.2,
- "pothole_density": -0.1,
- "speed_limit": 0.05,
- "street_lighting": 0.1,
- "pedestrian_walkway": 0.1,
- "crime_rate": -0.2,
- "flood_prone": -0.05,
- "Light_Intensity_Lux": 0.1,
- "Pedestrian_Traffic": 0.05,
- "Weather_Impact": -0.05

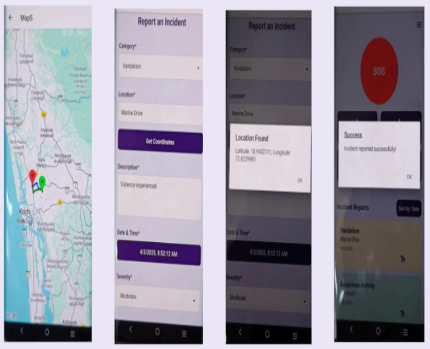
SCREENSHOTS & RESULTS



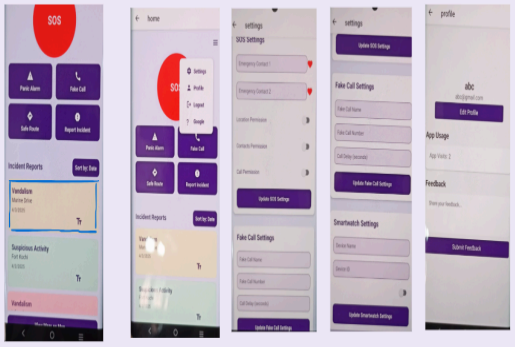
SCREENSHOTS & RESULTS



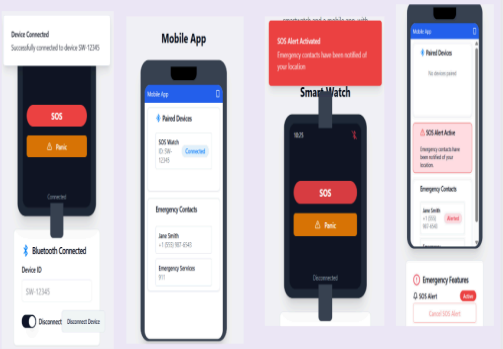
SCREENSHOTS & RESULTS



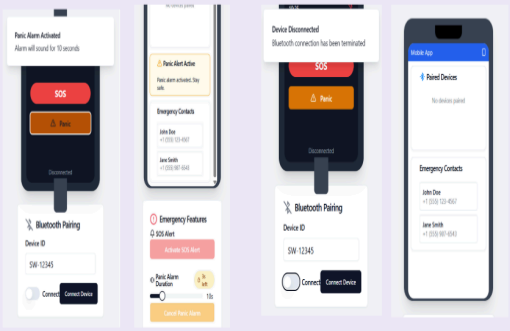
SCREENSHOTS & RESULTS



SCREENSHOTS & RESULTS



SCREENSHOTS & RESULTS



CONCLUSION

- A safety-centric mobile application designed to ensure personal security through real-time alerts and smart technologies.
- The application offers SOS alerts ,safe route recommendations, panic alarms to assist during emergencies thereby allowing a quick access to safety tools and fosters a community-driven support system.

FUTURE ENHANCEMENTS

Anomaly Detection for Route Safety

Use AI to detect sudden changes in route safety, like increased crime reports or heavy traffic.

Automatic Audio & Video Recording

Enabling automatic audio and video recording of the user when the SOS alert is activated.

SafeCircle Social Network

Create a trusted network where friends & family can share routes.
Introduce SafeCarpooling to connect users traveling in the same direction safely.

REFERENCES

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- **Link Name: https://developer.android.com/**
  Description: Google Developers. (n.d.). Android Developer Guide.
- **Link Name: https://www.gonoise.com/**
  Description: Noise Official. Smartwatch Compatibility and Features.

Appendix B: Vision, Mission, Programme Outcomes and Course Outcomes

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

RAJAGIRI SCHOOL OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

RAJAGIRI VALLEY, KAKKANAD, KOCHI, 682039

(Affiliated to APJ Abdul Kalam Technological University)

Institute Vision

To evolve into a premier technological institution, molding eminent professionals with creative minds, innovative ideas and sound practical skill, and to shape a future where technology works for the enrichment of mankind.

Institute Mission

To impart state-of-the-art knowledge to individuals in various technological disciplines and to inculcate in them a high degree of social consciousness and human values, thereby enabling them to face the challenges of life with courage and conviction.

Department Vision

To become a centre of excellence in Computer Science and Engineering, moulding professionals catering to the research and professional needs of national and international organizations.

Department Mission

To inspire and nurture students, with up-to-date knowledge in Computer Science and

Engineering, ethics, team spirit, leadership abilities, innovation and creativity to come out with solutions meeting societal needs.

Programme Outcomes (PO)

Engineering Graduates will be able to:

1.Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

2.Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3.Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4.Conduct investigations of complex problems: Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.**Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6.The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7.Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8.Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9.Individual and Team work: Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

10.Communication: Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations, and give and receive clear instructions.

11.Project management and finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.

12.Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Programme Specific Outcomes (PSO)

A graduate of the Computer Science and Engineering Program will demonstrate:

PSO1: Computer Science Specific Skills The ability to identify, analyze and design solutions for complex engineering problems in multidisciplinary areas by understanding the core principles and concepts of computer science and thereby engage in national grand challenges.

PSO2: Programming and Software Development Skills The ability to acquire programming efficiency by designing algorithms and applying standard practices in software project development to deliver quality software products meeting the demands of the industry.

PSO3: Professional Skills The ability to apply the fundamentals of computer science in competitive research and to develop innovative products to meet the societal needs thereby evolving as an eminent researcher and entrepreneur.

Course Outcomes

After the completion of the course the student will be able to:

CO1:

Identify technically and economically feasible problems (Cognitive Knowledge Level: Apply)

CO2:

Identify and survey the relevant literature for getting exposed to related solutions and get familiarized with software development processes (Cognitive Knowledge Level: Apply)

CO3:

Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions of minimal complexity by using modern tools & advanced programming techniques (Cognitive Knowledge Level: Apply)

CO4:

Prepare technical report and deliver presentation (Cognitive Knowledge Level: Apply)

CO5:

Apply engineering and management principles to achieve the goal of the project (Cognitive Knowledge Level: Apply)

Appendix C: CO-PO-PSO Mapping

COURSE OUTCOMES:

After completion of the course the student will be able to:

SL. NO	DESCRIPTION	Blooms' Taxonomy Level
CO1	Identify technically and economically feasible problems (Cognitive Knowledge Level: Apply)	Level 3: Apply
CO2	Identify and survey the relevant literature for getting exposed to related solutions and get familiarized with software development processes (Cognitive Knowledge Level: Apply)	Level 3: Apply
CO3	Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions of minimal complexity by using modern tools & advanced programming techniques (Cognitive Knowledge Level: Apply)	Level 3: Apply
CO4	Prepare technical report and deliver presentation (Cognitive Knowledge Level: Apply)	Level 3: Apply
CO5	Apply engineering and management principles to achieve the goal of the project (Cognitive Knowledge Level: Apply)	Level 3: Apply

CO-PO AND CO-PSO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	**3**	**3**	**3**	**3**		**2**	**2**	**3**	**2**	**2**	**2**	**3**	**2**	**2**	**2**
CO2	**3**	**3**	**3**	**3**	**3**	**2**		**3**	**2**	**3**	**2**	**3**	**2**	**2**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2**	**2**	**3**			**2**
CO4	**2**	**3**	**2**	**2**	**2**			**3**	**3**	**3**	**2**	**3**	**2**	**2**	**2**
CO5	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**3**	**2**		**2**	**3**	**2**	**2**	**2**

3/2/1: high/medium/low

JUSTIFICATIONS FOR CO-PO MAPPING

MAPPING	LOW/ MEDIUM/ HIGH	JUSTIFICATION
101003/CS622T.1-PO1	**HIGH**	Identify technically and economically feasible problems by applying the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
101003/CS622T.1-PO2	**HIGH**	Identify technically and economically feasible problems by analysing complex engineering problems reaching substantiated conclusions using first principles of mathematics.
101003/CS622T.1-PO3	**HIGH**	Design solutions for complex engineering problems by identifying technically and economically feasible problems.
101003/CS622T.1-PO4	**HIGH**	Identify technically and economically feasible problems by analysis and interpretation of data.
101003/CS622T.1-PO6	**MEDIUM**	Responsibilities relevant to the professional engineering practice by identifying the problem.
101003/CS622T.1-PO7	**MEDIUM**	Identify technically and economically feasible problems by understanding the impact of the professional engineering solutions.
101003/CS622T.1-PO8	**HIGH**	Apply ethical principles and commit to professional ethics to identify technically and economically feasible problems.
101003/CS622T.1-PO9	**MEDIUM**	Identify technically and economically feasible problems by working as a team.
101003/CS622T.1-PO10	**MEDIUM**	Communicate effectively with the engineering community by identifying technically and economically feasible problems.
101003/CS622T.1-P011	**MEDIUM**	Demonstrate knowledge and understanding of engineering and management principles by selecting the technically and economically feasible problems.
101003/CS622T.1-PO12	**HIGH**	Identify technically and economically feasible problems for long term learning.
101003/CS622T.1-PSO1	**MEDIUM**	Ability to identify, analyze and design solutions to identify technically and economically feasible problems.
101003/CS622T.1-PSO2	**MEDIUM**	By designing algorithms and applying standard practices in software project development and Identifying technically and economically feasible problems.
101003/CS622T.1-PSO3	**MEDIUM**	Fundamentals of computer science in competitive research can be applied to Identify technically and economically feasible problems.
101003/CS622T.2-PO1	**HIGH**	Identify and survey the relevant by applying the knowledge of mathematics, science, engineering fundamentals.

101003/CS622T.2-PO2	**HIGH**	Identify, formulate, review research literature, and analyze complex engineering problems get familiarized with software development processes.
101003/CS622T.2-PO3	**HIGH**	Design solutions for complex engineering problems and design based on the relevant literature.
101003/CS622T.2-PO4	**HIGH**	Use research-based knowledge including design of experiments based on relevant literature.
101003/CS622T.2-PO5	**HIGH**	Identify and survey the relevant literature for getting exposed to related solutions and get familiarized with software development processes by using modern tools.
101003/CS622T.2-PO6	**MEDIUM**	Create, select, and apply appropriate techniques, resources, by identifying and surveying the relevant literature.
101003/CS622T.2-PO8	**HIGH**	Apply ethical principles and commit to professional ethics based on the relevant literature.
101003/CS622T.2-PO9	**MEDIUM**	Identify and survey the relevant literature as a team.
101003/CS622T.2-PO10	**HIGH**	Identify and survey the relevant literature for a good communication to the engineering fraternity.
101003/CS622T.2-PO11	**MEDIUM**	Identify and survey the relevant literature to demonstrate knowledge and understanding of engineering and management principles.
101003/CS622T.2-PO12	**HIGH**	Identify and survey the relevant literature for independent and lifelong learning.
101003/CS622T.2-PSO1	**MEDIUM**	Design solutions for complex engineering problems by Identifying and survey the relevant literature.
101003/CS622T.2-PSO2	**MEDIUM**	Identify and survey the relevant literature for acquiring programming efficiency by designing algorithms and applying standard practices.
101003/CS622T.2-PSO3	**MEDIUM**	Identify and survey the relevant literature to apply the fundamentals of computer science in competitive research.
101003/CS622T.3-PO1	**HIGH**	Perform requirement analysis, identify design methodologies by using modern tools & advanced programming techniques and by applying the knowledge of mathematics, science, engineering fundamentals.
101003/CS622T.3-PO2	**HIGH**	Identify, formulate, review research literature for requirement analysis, identify design methodologies and develop adaptable & reusable solutions.

101003/CS622T.3-PO3	**HIGH**	Design solutions for complex engineering problems and perform requirement analysis, identify design methodologies.
101003/CS622T.3-PO4	**HIGH**	Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
101003/CS622T.3-PO5	**HIGH**	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools.
101003/CS622T.3-PO6	**MEDIUM**	Perform requirement analysis, identify design methodologies and assess societal, health, safety, legal, and cultural issues.
101003/CS622T.3-PO7	**MEDIUM**	Understand the impact of the professional engineering solutions in societal and environmental contexts and Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions.
101003/CS622T.3-PO8	**HIGH**	Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions by applying ethical principles and commit to professional ethics.
101003/CS622T.3-PO9	**MEDIUM**	Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.
101003/CS622T.3-PO10	**MEDIUM**	Communicate effectively with the engineering community and with society at large to perform requirement analysis, identify design methodologies.
101003/CS622T.3-PO11	**MEDIUM**	Demonstrate knowledge and understanding of engineering requirement analysis by identifying design methodologies.
101003/CS622T.3-PO12	**HIGH**	Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change by analysis, identify design methodologies and develop adaptable & reusable solutions.
101003/CS622T.3-PSO3	**MEDIUM**	The ability to apply the fundamentals of computer science in competitive research and prior to that perform requirement analysis, identify design methodologies.
101003/CS622T.4-PO1	**MEDIUM**	Prepare technical report and deliver presentation by applying the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
101003/CS622T.4-PO2	**HIGH**	Identify, formulate, review research literature, and analyze complex engineering problems by preparing technical report and deliver presentation.

101003/CS622T.4-PO3	**MEDIUM**	Prepare Design solutions for complex engineering problems and create technical report and deliver presentation.
101003/CS622T.4-PO4	**MEDIUM**	Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions and prepare technical report and deliver presentation.
101003/CS622T.4-PO5	**MEDIUM**	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools and Prepare technical report and deliver presentation.
101003/CS622T.4-PO8	**HIGH**	Prepare technical report and deliver presentation by applying ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
101003/CS622T.4-PO9	**HIGH**	Prepare technical report and deliver presentation effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.
101003/CS622T.4-PO10	**HIGH**	Communicate effectively with the engineering community and with society at large by prepare technical report and deliver presentation.
101003/CS622T.4-PO11	**MEDIUM**	Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work by prepare technical report and deliver presentation.
101003/CS622T.4-PO12	**HIGH**	Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change by prepare technical report and deliver presentation.
101003/CS622T.4-PSO1	**MEDIUM**	Prepare a technical report and deliver presentation to identify, analyze and design solutions for complex engineering problems in multidisciplinary areas.
101003/CS622T.4-PSO2	**MEDIUM**	To acquire programming efficiency by designing algorithms and applying standard practices in software project development and to prepare technical report and deliver presentation.
101003/CS622T.4-PSO3	**MEDIUM**	To apply the fundamentals of computer science in competitive research and to develop innovative products to meet the societal needs by preparing technical report and deliver presentation.
101003/CS622T.5-PO1	**HIGH**	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
101003/CS622T.5-PO2	**HIGH**	Identify, formulate, review research literature, and analyze complex engineering problems by applying engineering and management principles to achieve the goal of the project.

101003/CS622T.5-PSO2	**MEDIUM**	The ability to acquire programming efficiency by designing algorithms and applying standard practices in software project development to deliver quality software products meeting the demands of the industry and to apply engineering and management principles to achieve the goal of the project.
101003/CS622T.5-PSO3	**MEDIUM**	The ability to apply the fundamentals of computer science in competitive research and to develop innovative products to meet the societal needs thereby evolving as an eminent researcher and entrepreneur and apply engineering and management principles to achieve the goal of the project.