IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 10, June 2026
Impact Factor: 8.2

RAKSHAK: A Multimodal Women Safety and Empowerment Application with Novel Emergency Triggers and Conversational AI Support

Priyanka Avishkar Sawant[1], Sakshi Baban Sangale[2], Poonam Apa Sawant[3], Prof. Pratik Walke[4]
Department of Computer Engineering
Vidya Niketan College of Engineering, Bota

Abstract: *Women's safety remains a major concern in today's society, especially during emergency situations where immediate help is required. Existing safety applications often depend heavily on manual activation and internet connectivity, which may reduce their effectiveness in critical conditions. This project presents Rakshak, an intelligent women safety application designed to provide fast and reliable emergency assistance using multiple alert mechanisms. The system integrates features such as an SOS button, voice command recognition, eye blink detection, tap gesture detection, and smartwatch-based triggering to enable quick activation of emergency alerts. Once activated, the application shares the user's real-time GPS location with trusted contacts and emergency responders. To improve reliability, the system also includes an offline SMS feature for areas with poor or no internet access. Artificial intelligence technologies such as speech recognition and computer vision enhance the system's ability to detect distress situations efficiently. The proposed solution offers a user-friendly, responsive, and practical approach to improving personal safety and emergency communication.*

Keywords: Women Safety, Artificial Intelligence, SOS Alert, GPS Tracking, Eye Blink Detection, Voice Recognition, Emergency Response, Android Application

I. INTRODUCTION

Women's safety has become one of the most important social concerns in modern society due to the increasing number of harassment, assault, and emergency incidents reported across the world [1]. Although technological advancement has improved communication and emergency response systems, ensuring immediate assistance during dangerous situations remains a major challenge [2]. Many existing safety applications depend mainly on manual activation methods such as panic buttons or emergency calling, which may not be practical when the victim is unable to physically access the mobile device during an emergency [3].

Smartphones and wearable technologies have created new opportunities for developing intelligent safety systems that can provide rapid assistance with minimal user interaction [4]. Modern safety applications commonly include features such as GPS-based location tracking, emergency contact alerts, and real-time communication services [5]. However, many currently available systems still suffer from limitations such as dependency on stable internet connectivity, delayed alert transmission, and lack of automated threat detection [6].

Artificial Intelligence (AI) and Machine Learning (ML) have recently shown significant potential in improving emergency response systems through intelligent pattern recognition and real-time decision making [7]. Technologies such as speech recognition, computer vision, and sensor-based gesture detection can enable automatic identification of distress situations without requiring continuous manual input from the user [8]. These technologies can help improve response speed and increase the probability of timely assistance during critical situations.

To address these limitations, the proposed system Rakshak is designed as an AI-powered women safety application that provides multiple emergency triggering mechanisms including SOS button activation, voice command recognition, eye

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 10, June 2026
Impact Factor: 8.2

blink detection, tap gesture detection, and smartwatch integration [9]. The application is capable of sending real-time GPS location to trusted contacts and emergency responders, ensuring rapid assistance. Additionally, an offline SMS alert mechanism is incorporated to maintain functionality even in areas with poor or no internet connectivity [10].
The Rakshak system aims to provide a reliable, user-friendly, and intelligent safety solution that enhances personal security through automation, fast communication, and real-time emergency response.

II. PROBLEM STATEMENT

Women's safety continues to be a serious concern due to the rising incidents of harassment, violence, and unsafe travel conditions. Although several mobile safety applications are available, most rely heavily on manual activation and continuous internet connectivity, which can reduce their effectiveness during real emergency situations. In many cases, victims may not have enough time or ability to unlock their phones and trigger alerts manually. Additionally, limitations such as delayed emergency response, lack of intelligent threat detection, and poor performance in low-network areas create significant challenges. Therefore, there is a need to develop an intelligent and reliable safety system that can automatically detect distress situations through multiple triggering methods and provide immediate emergency assistance with both online and offline communication support.

III. OBJECTIVES

- To develop an intelligent women safety application for rapid emergency assistance.
- To implement multiple emergency trigger methods such as SOS button, voice, blink, and tap detection.
- To enable real-time GPS location sharing with trusted contacts during emergencies.
- To provide offline SMS alert functionality for areas with poor or no internet connectivity.
- To enhance emergency response using AI-based detection and communication technologies.

IV. LITERATURE SURVEY

Sarma et al. (2023) presented an Android-based safety system in their paper "Android-Based Woman Safety App," where they developed a mobile application capable of sending emergency alerts through SOS activation along with real-time GPS location sharing to trusted contacts. Their system improved emergency communication and response time during distress situations. However, the application depends mainly on manual activation and requires internet connectivity, limiting its effectiveness in sudden emergencies.

Premi et al. (2022) proposed a women safety application in their paper "FRNDY: A Women's Safety App," which introduced features such as shake-based SOS activation, fake call generation, and safe-zone heat maps for safer navigation. Their approach enhanced user safety by providing quick access to emergency features. However, the system lacks intelligent threat detection and may generate false alarms due to accidental motion triggers.

Agrawal et al. (2024) introduced a route safety prediction model in "SafeRoutes: Charting a Secure Path – A Holistic Approach to Women's Safety Through Advanced Clustering and GPS Integration." They used machine learning algorithms such as K-Means and Gaussian Mixture Models to identify safer travel routes based on location data. Their model improved route planning for safer movement. However, the system focuses only on route prediction and does not provide direct emergency response during critical situations.

Sidhu and Singh (2024) developed a mobile intelligence framework in their paper "Transforming Women Safety with Information Technology: A Mobile Real-Time Intelligence Framework," where they integrated multi-contact alerting, evidence storage, and real-time monitoring. Their framework improved emergency reporting and communication. However, evidence collection remains largely manual and lacks automated distress recognition.

Galgurgi and Chinchawade (2021) proposed a wearable safety solution in "Sakhi – The Saviour: An Android Application to Help Women in Times of Social Insecurity," which combined panic alert mechanisms, wearable support, and emergency communication. Their system offered quick alert transmission and evidence collection during emergencies. However, the wearable hardware increases system cost and reduces accessibility for all users.

Recent AI-based safety systems (2024) explored the use of Artificial Intelligence, speech recognition, and computer vision for automatic emergency detection through voice distress signals and gesture recognition. These systems improved passive monitoring and reduced dependence on manual interaction. However, many AI-based models still face challenges related to accuracy, false triggering, and high computational requirements in real-time mobile environments.

Comparison Table

Author & Year	Method Used	Advantages	Limitations
Sarma et al. (2023)	Android app with SOS + GPS	Quick alert sharing	Manual activation
Premi et al. (2022)	Shake detection, fake call	Easy emergency trigger	False alarms
Agrawal et al. (2024)	ML-based safe route prediction	Safer route planning	No direct emergency response
Sidhu & Singh (2024)	Real-time intelligence framework	Multi-contact alerts	Manual evidence collection
Galgurgi & Chinchawade (2021)	Wearable + Android safety app	Fast alert system	High cost
AI-Based Systems (2024)	AI, voice & gesture detection	Automatic detection	Accuracy issues

IV. WORKING OF SYSTEM

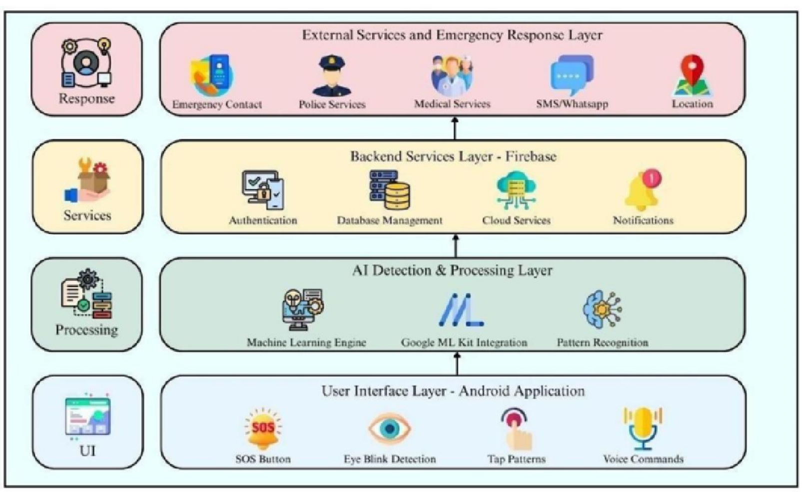

Fig 1: System Architecture

The Rakshak system operates through four major layers: User Interface Layer, AI Detection & Processing Layer, Backend Services Layer, and External Services & Emergency Response Layer. The working of the system is described below:

1. User Input and Emergency Trigger Activation

The system begins at the User Interface Layer, where the user interacts with the Android application. The application provides multiple emergency triggering options such as SOS button, eye blink detection, tap pattern recognition, and voice commands. These trigger mechanisms ensure that the user can activate emergency alerts either manually or hands-free during critical situations.

2. Data Collection from Sensors

Once a trigger is initiated, the application collects input data from device sensors such as the camera, microphone, and accelerometer. The camera captures facial movements for eye blink detection, the microphone listens for emergency voice commands, and motion sensors detect tap patterns on the device.

3. AI-Based Detection and Processing

The collected input is sent to the AI Detection & Processing Layer for analysis. This layer consists of the Machine Learning Engine, Google ML Kit Integration, and Pattern Recognition Module. The AI models process the sensor data to identify valid emergency signals and reduce false triggering by verifying predefined patterns.

4. Emergency Event Validation

After processing, the system validates whether the detected event is a genuine emergency. For example, it checks if the user blinked three times, used the correct tap pattern, or spoke predefined SOS keywords such as “Help” or “SOS”. Once validated, the emergency alert process is activated.

5. Backend Service Communication

The validated emergency event is forwarded to the Backend Services Layer, which is implemented using Firebase. This layer manages user authentication, database storage, cloud communication, and push notifications. It stores alert details, user information, and emergency logs securely in the cloud.

6. Location Retrieval and Alert Generation

The system retrieves the user’s real-time GPS location and creates an emergency alert containing user details, current location, and alert type. This ensures accurate tracking and faster response during emergencies.

7. Alert Transmission to Emergency Services

The generated alert is sent to the External Services and Emergency Response Layer. Emergency notifications are transmitted to trusted contacts, police services, medical services, and other emergency responders through SMS, WhatsApp, or push notifications.

8. Emergency Response and Assistance

After receiving the alert, responders can access the user’s location and take immediate action. This enables quick assistance and improves safety during critical situations.

V. SYSTEM DESIGN

1 System Overview

The Rakshak system is an AI-powered Android application developed to enhance women’s safety by providing intelligent and rapid emergency response mechanisms. The system integrates multiple emergency trigger methods such as SOS button activation, voice command detection, eye blink recognition, and tap gesture detection to ensure fast alert generation during critical situations. It uses Artificial Intelligence, sensor-based detection, GPS tracking, and cloud communication to identify emergency conditions and notify trusted contacts or emergency responders. The overall

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 10, June 2026
Impact Factor: 8.2

system is designed to work efficiently in both online and offline environments, ensuring reliable communication even in low-network areas.

2 System Design

The Rakshak system is divided into four major layers for smooth operation and efficient data flow.

1. User Interface Layer

This is the front-end layer of the Android application where users interact with the system. It includes the SOS button, emergency contact settings, alert configuration, and trigger activation options such as blink detection, tap patterns, and voice commands. This layer ensures a simple and user-friendly interface for quick emergency access.

2. Input Acquisition Module

This module collects real-time input from mobile device sensors and hardware components. The camera captures eye movements, the microphone detects emergency voice commands, and the accelerometer sensor identifies tap gestures. These inputs act as raw data for emergency detection.

3. AI Detection and Processing Layer

This layer processes sensor inputs using Machine Learning algorithms, Google ML Kit, and pattern recognition techniques. It analyzes user actions to detect valid emergency triggers and reduces false alarms by verifying predefined patterns such as three eye blinks or specific SOS keywords.

4. Event Validation Module

After processing, the system validates whether the detected input represents a genuine emergency. Only verified triggers are allowed to activate the alert mechanism. This improves system reliability and avoids accidental emergency notifications.

5. Backend Services Layer

The backend is implemented using Firebase cloud services. This layer manages authentication, database storage, cloud synchronization, and push notifications. It stores user profiles, emergency contacts, and alert history securely.

6. Location Tracking Module

This module continuously retrieves the user's real-time GPS location using map services. During emergencies, location coordinates are attached to alert messages so responders can identify the exact user position.

7. Communication Module

This module handles emergency message transmission through Firebase Cloud Messaging (FCM), SMS, or WhatsApp services. If internet connectivity is unavailable, the system switches to offline SMS mode to maintain alert delivery.

8. Emergency Response Layer

This is the final layer where alerts reach trusted contacts, police services, and medical responders. After receiving notifications, emergency responders can quickly take necessary action to assist the user.

The layered design ensures that the Rakshak system operates efficiently, provides fast emergency detection, and delivers reliable communication during critical situations.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 10, June 2026
Impact Factor: 8.2

VI. RESULTS

Module 1: User Interface

Fig 2: User Interface

The main interface of the Rakshak application provides quick access to important safety features such as location sharing, nearby hospitals, emergency contacts, fake call, safe route analysis, and SOS detection.

Module 2: Emergency Locations

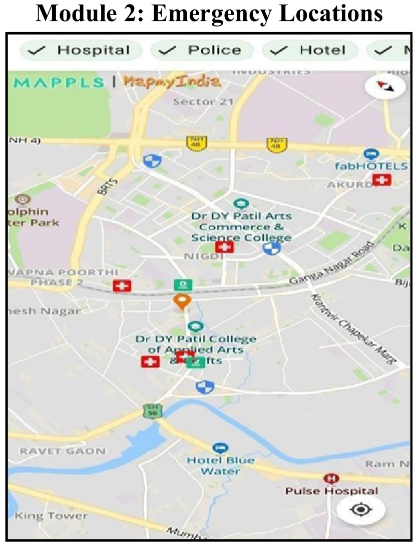

Fig 3: Emergency Locations

This module displays nearby emergency services such as hospitals, police stations, and safe locations using map integration. It helps users quickly identify and navigate to the nearest assistance point during emergencies.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 10, June 2026
Impact Factor: 8.2

Module 3: Fake Call Feature

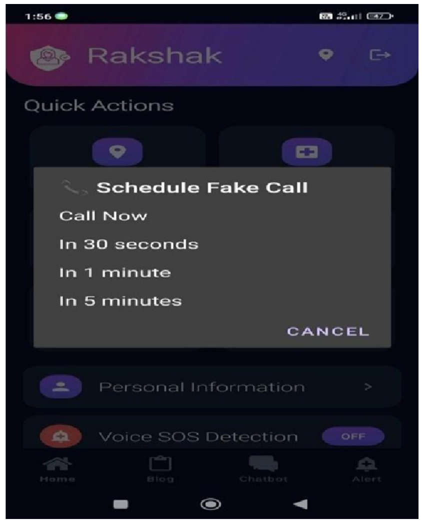

Fig 4: Fake Call Feature

The fake call module allows users to schedule a fake incoming call instantly or after a selected time interval. This feature helps users escape uncomfortable or unsafe situations without raising suspicion.

Module 4: Safe Route Planning

This module analyzes route safety based on nearby services, distance, travel time, and historical safety data. It suggests safer navigation routes to improve user security while traveling.

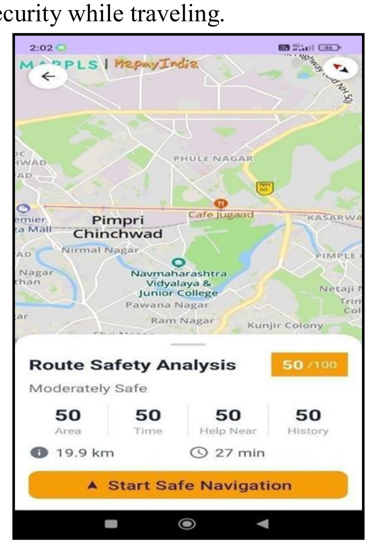

Fig 5: Safe Route Planning

DOI: 10.48175/568

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 10, June 2026
Impact Factor: 8.2

Module 5: SOS Trigger Mechanism

Fig 6: SOS Trigger Mechanism

This module enables advanced emergency triggering methods such as blink detection, tap detection, shake-to-SOS, and smartwatch integration. It ensures alerts can be activated even without manual phone interaction.

Module 6: AI Chatbot Assistance

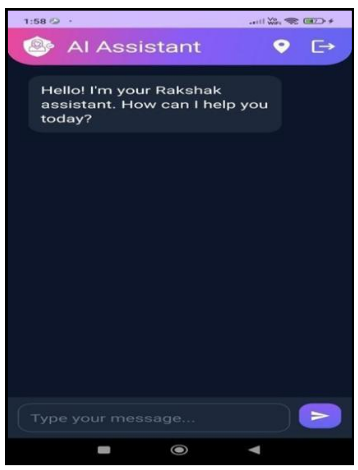

Fig 7: AI Chatbot

The AI assistant provides 24×7 conversational support to users by answering safety-related queries and offering guidance during emergencies. This improves user engagement and assistance availability.

VII. CONCLUSION

The Rakshak system successfully demonstrates an intelligent and reliable women safety solution using modern technologies such as artificial intelligence, sensor-based detection, GPS tracking, and cloud communication. The application effectively integrates multiple emergency triggering mechanisms including SOS button activation, voice commands, blink detection, and tap gesture recognition to ensure rapid alert generation during critical situations. The inclusion of both online and offline communication improves system reliability in different network conditions. Overall, the proposed system provides a practical, user-friendly, and efficient approach for enhancing personal safety and emergency response.

DOI: 10.48175/568

VIII. FUTURE SCOPE

The Rakshak system can be further enhanced by integrating advanced AI capabilities such as emotion recognition, behavior analysis, and predictive threat detection for more accurate emergency identification. Future improvements may include direct integration with government emergency helplines, automatic audio/video evidence recording, and smartwatch-based biometric monitoring. Additional features such as multilingual chatbot support and improved route safety prediction can further increase accessibility and effectiveness, making the system more robust for large-scale real-world deployment.

REFERENCES

[1] G. Eason, S. Bhadre, D. Patil, S. Bhasme, and V. Shilimkar, "Raksha – The Women's Safety Application," vol. 11, no. 5, 2024.

[2] K. Agrawal et al., "SafeRoutes: Charting a Secure Path – A Holistic Approach to Women's Safety Through Advanced Clustering and GPS Integration," IEEE Access, vol. 12, pp. 166368–166380, 2024.

[3] P. Sarma, D. Ahmed, and P. Bezbaruah, "Android-Based Woman Safety App," Indian Journal of Science and Technology, vol. 16, no. SP2, pp. 60–69, 2023.

[4] P. Premi, K. S. Savita, and N. Millatina, "FRNDY: A Women's Safety App," in Proc. ICCUBEA, 2022, pp. 1–5.

[5] V. Galgurgi and A. Chinchawade, "Sakhi – The Saviour: An Android Application to Help Women in Times of Social Insecurity," vol. 8, no. 1, 2021.

[6] K. S. Sidhu and K. Singh, "Transforming Women Safety with Information Technology: A Mobile Real-Time Intelligence Framework," Journal of Electrical Systems, 2024.

[7] Google, "ML Kit Documentation," 2025.
Available: Google ML Kit

[8] Firebase Documentation, Google, 2025.

[9] Google, "Speech-to-Text API Documentation," 2025.
Available: Speech-to-Text API

[10] Android Developers, "SMS Manager API," 2025.
Available: Android SMS Manager

[11] Android Developers, "Location Services Overview," 2025.
Available: Android Location Services

[12] Mappls Developer Platform, Mappls, 2025.

[13] I. Goodfellow, Y. Bengio, and A. Courville, Deep Learning. MIT Press, 2016.

[14] S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, 4th ed. Pearson, 2021.

[15] A. Géron, Hands-On Machine Learning with Scikit-Learn, Keras and TensorFlow, 3rd ed. O'Reilly, 2022.

[16] R. S. Pressman and B. R. Maxim, Software Engineering: A Practitioner's Approach, 9th ed. McGraw-Hill, 2019.

[17] I. Sommerville, Software Engineering, 10th ed. Pearson, 2016.

[18] M. A. Hossain, P. K. Atrey, and A. El Saddik, "Smart Context-Aware Multimedia Surveillance System," IEEE Systems Journal, vol. 11, no. 3, pp. 1452–1463, 2017.

[19] D. Lowe, "Distinctive Image Features from Scale-Invariant Keypoints," International Journal of Computer Vision, vol. 60, no. 2, pp. 91–110, 2004.

[20] J. Redmon and A. Farhadi, "YOLO: Real-Time Object Detection," 2018.