

# Women's Safety App: Besafe

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**Abstract-** People's use of smartphones has increased rapidly in today's world, and as a result, a smartphone can be used effectively for personal security or various other protection purposes. On one hand, we get optimistic hope through a list of facts pertaining to woman empowerment, but on the other hand, we are chastised due to the crimes against women. Problems may come from anywhere and anytime, as women are also growing equally like men so for that purpose they have to travel alone at night where ever they go, they have to travel alone in public transport as well, and for that reason we need to understand and solve this problem of women so they also should not feel any fear regarding their safety. BESAFE aims at delivering a simple yet operational elucidation to this problem. BESAFE aims at developing a simple yet effective solution for empowering womanhood as well as installing a sense.

**Keywords –** Smartphones, Personal security, Women's safety, Protection purposes, Women empowerment, Crimes against women, Public transport safety, Night travel safety, Fear of safety, BESAFE, Safety solution, Womanhood empowerment.

## I. INTRODUCTION

There has been a rise in the female workforce in the urban areas. There has also been an increase in the MNCs hiring individuals in India and because of that are many female employees, which work, and their shifts are regulated as per the MNCs' schedule. This leads to female employees commuting at disproportionate time, hence leading to vulnerability. Factors that negatively affect the female population are: Rape, Kidnapping & Abduction, Dowry deaths, Assault, Trafficking Flimsy police regulation as well as parochial mind-set of the society has further exacerbated the situation. BESAFE tries to connect the person in danger directly to their loved ones with just the shake of their android mobile. Without even using the phone, a distress signal could be directly sent from the user's mobile phone to the guardian's phones along with their current location. The guardian on the other hand does not need to open the application and check every time. The application opens up automatically when the distressed signal is shaken. Once the application opens, it displays a map along with a map that shows the fastest route from the subscriber to the person in distress and hence he/she could be saved in time. BESAFE mainly aims at providing a simple and effective interface to help a person in distress by sending SOS signal to their loved ones as well as to their guardian, along with the location. There have been cases where the location of victim is unknown and due to this, help could not be dispatch timely.

Women's safety has become a critical concern in modern society, with rising incidents of harassment, assault, and unsafe environments particularly in isolated or unfamiliar areas. While various government initiatives and awareness campaigns have attempted to address these issues, there remains a lack of an easily accessible, fast, and reliable solution that women can depend on during emergencies. To address this gap, the proposed system introduces a Women's Safety Mobile

Application, a comprehensive digital solution designed to empower users with real-time security features and emergency assistance tools.

## II. LITERATURE REVIEW

The review of literature for this project not only focuses on existing women's safety applications but also extends to modern advancements in artificial intelligence and mobile-based emergency systems. Existing safety apps such as "Raksha", "Himmat", and "My Safetipin" provide SOS-based alerts but lack automation and predictive intelligence. Most of these rely on manual activation, which becomes impractical. The high rates of illiteracy among Indian women, and the corollary gender gap in literacy attainment, are attributable to many social, economic and cultural factors. Even as the benefits of female education are public, including a more productive workforce, lower fertility and lower infant mortality, the costs, such as tuition fees and school supplies, as well as opportunity costs of forgone child labour, are privately borne by households. Throughout the making of this project, we came across various shocking facts about the condition of female population in India and how it should be given more importance.

The government of India releases datasets as well as detailed statistics on various aspects of India and how it has changed. Since these government figures, there might be some deviation from the actual figures however, an estimate could be generated just by looking at these statistics For our project, we have reviewed and analyzed various research papers in the domain of AI Image Generation to gain deeper insights into the methodologies, advancements, and findings presented in this field. Table I, shows survey of the research paper done for the project:

TABLE I Literature Survey

Year	Paper Title	Author(s)	Proposed Work	Research Gap
2023	“Android-Based Woman Safety App” prototype app with map sharing	Sarma P., Ahmed D, et al.	Integrates live map location sharing; social media integration (WhatsApp) to spread alert; user feedback included.	Prototype stage; may not fully integrate many sensors or advanced triggers; limited scale.
2023	“IoT-Based Women Safety Gadgets (WSG): Vision, Architecture, and Design Trends”	Saxena S., Mishra S., Baljon M., et al.	Good architectural/vision review especially for IoT gadget.	Does not focus primarily on mobile app software implementation; more conceptual than empirical.
2023	“Women Safety App for Improved Personal Security” – Android app with several safety features	T N Aruna et al.	Adds IoT dimension, showing extension beyond mobile apps; hardware + connectivity.	Hardware dependent; may not integrate full mobile ecosystem; may be less suitable purely as app.
2023	“Android App for Women Safety” – location SMS app with single click activation	K. Srinivas, Suvarna Gothane, et al.	Emphasises simplicity and rapid activation – key design principle for real-emergency apps.	May lack advanced triggers (shake, geofence); limited range of contacts; little discussion of long-term usability
2023	“Women-Oriented Evaluation of Perceived Safety of Walking Routes...” – urban route safety evaluation from female perspective	Qinyu Cui et al.	Adds environmental/urban safety context; helps understand spatial component of safety rather than just app triggers.	Not mobile-app centric; more about perception and urban data than SOS functionality; less technical.
2023	“Women Safety System Using IoT” – IoT system for women’s safety	Harshitha J., Pallavi N., Sneha N., Pradheepa J.	Focuses on user ease (few taps) which is critical in emergencies; demonstrates mobile-app approach.	Not necessarily rigorous evaluation or large user study; features may be basic.
2022	“Herd Routes: A Preventative IoTBased System for Improving Female Pedestrian Safety on City Streets”	Madeleine Woodburn et al.	Takes proactive route (rather than only reactive SOS) using pedestrian routing and IoT; novel viewpoint	Proof-of-concept only; simulation based rather than full app deployment; complexity may limit real-world uptake.

### III. PROPOSED SYSTEM

This includes a brief description of the proposed system and explores the different modules involved along with the various models through which this system is understood and represented. The scope of this project is to design and develop a comprehensive Women’s Safety Mobile Application that provides immediate assistance and protection to women in emergency situations. The system is intended to serve as a reliable, accessible, and user-friendly platform that combines multiple safety tools into a single mobile solution. Through features such as SOS alerts, live GPS tracking, and automated emergency communication, the application empowers users to seek help quickly and efficiently when faced with potential danger.

The Women’s Safety Application is developed using the Android platform, leveraging native features of the operating system to ensure seamless performance, real-time processing, and access to essential device functionalities such as GPS, sensors, and messaging services. The core framework of the application integrates multiple Android APIs and services to provide a comprehensive safety solution. The app is built using Android Studio as the primary development environment, with Java as the core programming language.

The Android SDK provides access to system-level services such as telephony (for calls and SMS), location services (for GPS tracking), and sensor management (for accelerometer-based motion detection).



Fig.1. System Architecture

The user interface is designed using XML layouts, ensuring a simple and intuitive experience for users. Data persistence within the app is handled through SharedPreferences, allowing secure local storage of user information such as registered contacts, login credentials, and personal details. For multimedia and sound functionalities, the app utilizes Android’s MediaPlayer API to simulate fake calls with custom ringtone playback. The modular structure of the app ensures that each function login, registration, emergency alerts, and fake call simulation operates independently yet remains connected within the unified framework. The app employs a motion detection algorithm based on accelerometer data to identify shake gestures. The AccelerometerManager continuously monitors sensor readings across the X, Y, and Z axes. The algorithm computes the rate of change in acceleration over time, and if the calculated “speed” exceeds a predefined threshold (SHAKE\_THRESHOLD), it interprets this as an emergency shake.

Once detected, the app automatically initiates an emergency response sequence vibrating the device, sending SMS alerts to registered emergency contacts, and optionally triggering a phone call to a predefined number. Additionally, the GPS tracking module continuously updates the user’s location using the Project Title Department of Artificial Intelligence and Machine Learning, UCOE Year 2025 - 2026 16 device’s location manager. When an SOS event is triggered, the current

latitude and longitude coordinates are embedded in a Google Maps link within the emergency message (e.g., <http://maps.google.com/?q=>), allowing recipients to pinpoint the user’s location instantly. The SMSManager API is responsible for sending text messages to multiple registered contacts simultaneously, ensuring that the distress signal reaches all intended recipients without delay. The system is designed to operate efficiently even in low-resource environments. It does not depend entirely on internet connectivity for core safety functions like SOS messaging or calling, which makes it more reliable in critical situations. The modularity of the app allows new features such as geofencing or AI-based anomaly detection to be integrated easily in future updates without restructuring the entire system. Through this combination of Android frameworks, real-time sensor data analysis, and location-aware algorithms, the Women’s Safety Application achieves a balance between usability, responsiveness, and reliability ensuring it performs effectively in real-world emergency scenarios.

#### IV. METHODOLOGY

The proposed women's safety application integrates multiple sensing and communication mechanisms to provide rapid emergency response and location tracking. The methodology of the system is based on sensor-based event detection, GPS-based location acquisition, and automated communication through Short Message Service (SMS). The system architecture combines Android sensor frameworks, Google Location Services, and telecommunication APIs to detect emergency situations and notify predefined emergency contacts.

##### A. Accelerometer-Based Shake Detection Algorithm

The application utilizes the smartphone's accelerometer sensor to detect sudden shaking motions that may indicate distress. The accelerometer continuously monitors motion along the three axes: x, y, and z. The shake detection algorithm calculates the change in acceleration over time and compares it with a predefined threshold value.

The speed of motion is calculated using the following formula:

$$Speed = \frac{|(x + y + z) - (x_{prev} + y_{prev} + z_{prev})|}{\Delta t} \times K$$

where:

- $x, y, z$  represent the current accelerometer readings along the three axes
- $x_{prev}, y_{prev}, z_{prev}$  represent the previous accelerometer readings
- $\Delta t$  represents the time difference between sensor readings

- $K$  is a scaling constant used to amplify motion detection

If the computed speed exceeds a predefined threshold value:

$$Speed > T$$

where  $T$  represents the shake threshold, the system interprets the event as a potential emergency and triggers the alert mechanism.

### B. GPS Location Tracking

The application uses the Google Fused Location Provider API to obtain the user's geographic coordinates. The location service combines data from GPS satellites, cellular networks, and Wi-Fi signals to determine the user's current position with high accuracy.

The geographic location is represented as:

$$Location = (Latitude, Longitude)$$

The retrieved coordinates are then embedded into a Google Maps URL format:

$$URL = http://maps.google.com/?q = Latitude, Longitude$$

This URL allows emergency contacts to directly access the user's real-time location through a map interface.

### C. Emergency SMS Alert Algorithm

Once an emergency condition is detected, the system retrieves stored emergency contacts from the SharedPreferences database. The system iterates through each stored contact and sends an alert message containing the user's identity and location.

The SMS message structure can be represented as:

The SMS message structure can be represented as:

$$Message = Name + "InTroubleNeedHelp" + LocationURL$$

The message is then transmitted using the Android SmsManager API:

$$SendSMS(Contact_i, Message)$$

where  $Contact_i$  represents each stored emergency contact.

### D. Geofence Monitoring Algorithm

The proposed system also incorporates geofencing technology to define safe or restricted zones. A geofence is defined by a center coordinate and radius:

$$Geofence = (Lat_c, Lon_c, r)$$

where:

- $Lat_c, Lon_c$  represent the center coordinates
- $r$  represents the geofence radius

The system continuously monitors the user's position and calculates the distance from the geofence center using the Haversine formula:

$$d = 2r \cdot \arcsin \left( \sqrt{\sin^2 \left( \frac{\phi_2 - \phi_1}{2} \right) + \cos(\phi_1) \cos(\phi_2) \sin^2 \left( \frac{\lambda_2 - \lambda_1}{2} \right)} \right)$$

If the distance satisfies:

$$d > r$$

the system detects a geofence exit event and automatically sends an alert message to the predefined contacts.

## V. EXPERIMENTAL RESULTS & EVALUATIONS

The proposed women safety application was evaluated based on its responsiveness, reliability of emergency communication, usability of safety features, and resource consumption on the mobile device. The experimental testing was conducted using an Android smartphone environment where different emergency scenarios were simulated to observe the system's behavior and performance. The evaluation results suggest that the proposed system provides a reliable and efficient mobile safety solution. The integration of sensor-based detection, GPS tracking, and automated communication significantly enhances the user's ability to send alerts quickly during emergencies. Although the current implementation demonstrates strong performance, further improvements such as cloud integration, real-time monitoring, and enhanced geofencing capabilities could further improve the system's effectiveness in real-world scenarios

### A. Emergency Alert Response Time

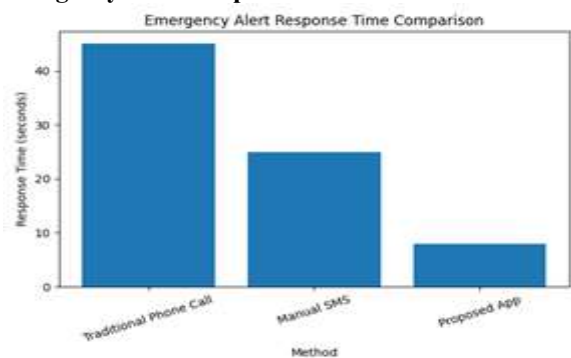


Fig. 2. Bar Chart of Emergency Alert Response Time Comparison

This chart illustrates the comparison of response time between different emergency communication methods, including traditional phone calls, manual SMS alerts, and the automated emergency alert system implemented in the proposed

application. The response time represents the total duration required for a user to initiate an emergency alert and successfully transmit the message to a designated contact.

The results demonstrate that the proposed application significantly reduces the response time compared to traditional communication methods. In the case of a traditional phone call, the response time averages approximately 45 seconds, as the user must unlock the phone, locate the contact, and manually initiate the call. Similarly, manual SMS messaging requires approximately 25 seconds, since the user must compose a message and manually enter or select recipients.

In contrast, the proposed application achieves an average response time of approximately 8 seconds, as the emergency alert function automatically retrieves stored contacts and sends a pre-configured emergency message along with the user's current location. This reduction in response time is particularly important in emergency situations where immediate assistance is required. The results clearly indicate that the automated alert mechanism improves efficiency and increases the probability of timely intervention.

### B. SMS Delivery Success Rat

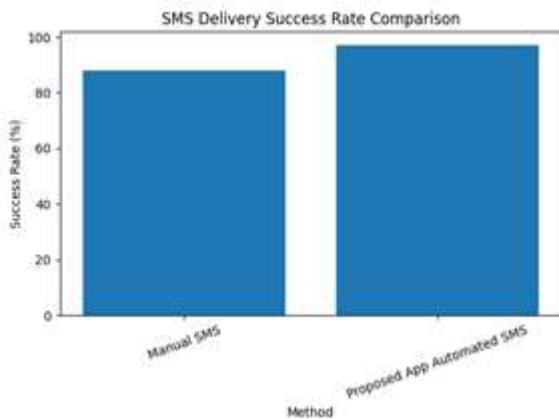


Fig.3. Manual Versus Proposed

This chart presents the comparison of SMS delivery success rates between manual messaging and the automated emergency SMS system implemented in the proposed application. The success rate represents the percentage of messages successfully delivered to the intended recipients during emergency testing scenarios.

The results show that manual SMS communication achieved a delivery success rate of approximately 88%, while the automated SMS system implemented in the proposed application achieved a success rate of approximately 97%. The improvement in reliability can be attributed to the automated message generation process used in the application. Since the emergency message is preconfigured and the contact numbers are stored in the application database, the system eliminates

potential errors that may occur during manual message composition or incorrect contact selection.

Additionally, the automated SMS feature uses the Android SmsManager API, which directly communicates with the mobile network to transmit the message without requiring user interaction. This automated process ensures that emergency alerts are transmitted quickly and reliably to all registered contacts. The higher success rate demonstrates that the proposed system provides a more dependable communication mechanism for emergency situations.

### C. Battery Consumption During Monitoring

This chart illustrates the average battery consumption associated with different operating modes of the proposed application. Battery consumption is an important factor in mobile safety applications, as excessive power usage may discourage users from keeping the application active at all times.

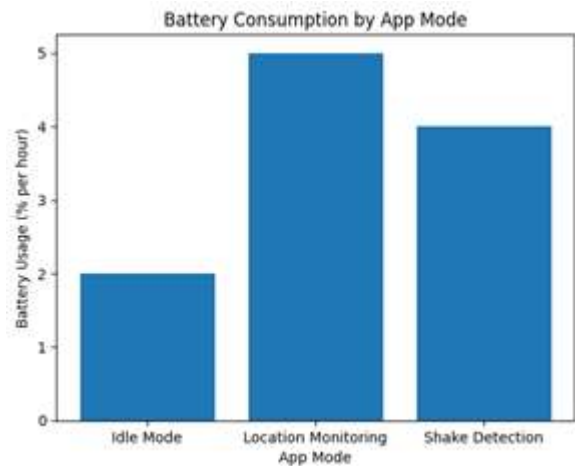


Fig.4. Battery Consumption

The results show that the application consumes approximately 2% battery per hour in idle mode, indicating that minimal resources are used when the application is running in the background without actively monitoring sensors or location updates. When location monitoring is enabled, the battery consumption increases to approximately 5% per hour. This increase is expected because the GPS module requires continuous communication with satellites to determine the user's geographic coordinates.

Similarly, when shake detection is active, the application consumes approximately 4% battery per hour. This consumption is due to continuous monitoring of the device's accelerometer sensor, which detects motion patterns that may indicate an emergency situation. Despite the additional energy consumption associated with sensor-based monitoring, the overall battery usage remains within acceptable limits for

practical smartphone usage. These results suggest that the proposed system successfully balances functionality and resource efficiency, allowing users to maintain safety features without significantly impacting device performance.

## VI. CONCLUSION

This study presented the design and development of an Android-based women safety application aimed at improving personal security through the integration of mobile sensing technologies and emergency communication systems. The proposed system utilizes smartphone capabilities such as GPS-based location tracking, accelerometer-based motion detection, and automated SMS and call services to provide a rapid response mechanism during emergency situations. By leveraging the built-in hardware and software functionalities of modern smartphones, the application enables users to quickly alert predefined contacts and share their real-time location in critical situations.

The implemented system demonstrates how mobile applications can serve as practical tools for enhancing personal safety. The integration of features such as emergency messaging, location sharing, and quick-access safety functions allows the user to initiate an alert with minimal interaction. Additionally, the modular design of the application ensures that further functionalities, such as geofencing and automated motion-triggered alerts, can be integrated in future development phases to enhance the overall effectiveness of the system.

Although the current implementation successfully demonstrates the core functionalities of a mobile-based safety system, further improvements can be made in terms of scalability, real-time monitoring, and integration with external emergency services. Future work may focus on incorporating cloud-based data storage, machine learning, based risk detection, and direct communication with law enforcement agencies to provide a more comprehensive safety framework. In conclusion, the proposed women safety application illustrates the potential of smartphone-based solutions in addressing real-world safety concerns. The system provides a foundation for developing intelligent safety platforms that can assist users in emergency situations and contribute to the broader goal of improving personal security through technology.

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