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WE SAFE APP

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ABSTRACT

Women's safety remains a critical concern worldwide, with rising cases of harassment and violence in public spaces. Traditional safety measures often fail to provide immediate assistance, highlighting the need for technology-driven solutions. This research explores the role of mobile applications, AI-based threat detection, GPS tracking, and IoT-enabled devices in enhancing women's security. The study evaluates existing safety apps, their effectiveness, and areas for improvement. Furthermore, it proposes an integrated safety model combining real-time location sharing, emergency alert systems, and AI-driven risk assessment. By analyzing user feedback, technical challenges, and policy implications, this research aims to develop a comprehensive framework for a smart safety system that empowers women and ensures swift emergency responses.

Keywords- Women Safety App; Android; SOS; voice recording; panic button,we safe app,

1. INTRODUCTION

In today's world, it is not safe for a person to travel alone at night especially for women; it will be high time to travel alone because a woman is not highly strong as men to protect herself from them. The good way to reduce chances in becoming a victim of violent crime (robbery, sexual assault, rape, domestic violence) is to identify and call on resources to help you out of unsafe situations. Whether you are in instant trouble or got separated from friends during night and do not know to reach home, having these apps on your phone can diminish our risk and bring assistance when we require it. In this paper, we present Security Alert, an application for smart phones working over android platform. National Crime Records Bureau of India reported incidents of crime against women increased 6.4% during 2012, and a crime against a woman is committed every three minutes. 65% of Indian men believe women should tolerate violence to keep the family together, and women sometimes deserve to be beaten. In January 2011, the International Men and Gender Equality Survey (IMAGES) Questionnaire reported Volume 7, Issue 3, May-June-that 24% of Indian men had committed sexual violence at some point during their lives[6].

Our motto in developing this app is to provide a safe environment to women through smart phone as today most of the people are carrying smart phones to wherever they go. Of course, the Delhi Nirbhaya case has made the Government to make the laws tougher, but even though the sexual crime rate in India have not decreased. So, it is better to take our own safety measures rather than becoming a victim of those crimes. This paper is organized as follows.

2. LITERATURE REVIEW

A literature survey on women's safety apps highlights the growing importance of mobile technology in addressing safety concerns for women in public and private spaces. Numerous studies emphasize the heightened fear of harassment and violence that limits women's mobility and participation in social and economic activities. Various mobile applications, such as bSafe, Safetipin, and Circle of 6, have been developed to provide SOS alerts, and real-time communication with emergency contacts, enhancing personal safety[1][2][3].

Features such as automated alerts, voice activation, and crowdsourced safety reporting have been identified as essential components of these apps. While technologies like artificial intelligence (AI) and wearables are increasingly being explored, privacy and data security remain significant concerns, as users are often reluctant to share sensitive information. Additionally, issues such as false alerts and system failures have been noted, underscoring the need for more reliable algorithms.[4][5]

Studies also emphasize the importance of user-centered design (UCD) for ensuring these apps are intuitive and accessible, particularly in emergencies. However, the effectiveness of these apps in reducing crime rates remains underexplored, as few evaluations assess their long-term impact on women's safety. Another critical gap is the lack of integration with law enforcement systems, limiting the apps' ability to provide immediate help. Finally, while most research focuses on urban environments, there is a growing recognition that women in rural areas and marginalized communities may face unique safety challenges and require customized solutions.[7]

Overall, while the development of women's safety apps represents an important technological advancement, further research is needed to address privacy concerns, improve app reliability, and evaluate their effectiveness in diverse contexts.

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Objectives:

1. Improve Personal Safety:
- Help users share their location with friends or family in real-time when they feel unsafe
2. Emergency Alerts:
- Allow users to quickly send alerts to local authorities and emergency contacts when they are in danger
3. Panic Button:
- Include a button that users can press to send an emergency alert without drawing attention
4. Safety Resources:
- Provide tips on staying safe, self-defense techniques, and information about personal safety
5. Community Support:
- Create a way for users to report incidents and share safety alerts with others in their community
6. Incident Reporting:
- Allow users to document and report any harassment or violence they experience
7. Connect with Local Authorities:
- Work with local police and emergency services to ensure quick responses to alerts
8. Easy to Use:
- Make the app simple and user-friendly, especially in stressful situations

3. METHODOLOGY

1. Data Collection

This initial phase involves gathering comprehensive information from various sources to understand the safety issues women face. The data collection process includes:

- Crime Reports: Analyzing statistics and reports from law enforcement agencies to identify trends and hotspots for crimes against women.
- User Feedback: Collecting insights from potential users through surveys, interviews, or focus groups to understand their concerns, needs, and preferences regarding safety features.
- Safety Data from Existing Apps: Reviewing data and performance metrics from existing safety applications to identify effective features and common shortcomings. This helps in understanding what works well and what needs improvement.

2. Feature Identification

In this phase, the focus is on identifying and prioritizing essential features that the app should include to effectively enhance women's safety. Key features may include:

- Location Tracking: Enabling users to share their real-time location with trusted contacts, which can be crucial in emergencies.
- Emergency Alerts: Allowing users to send alerts to local authorities and emergency contacts quickly when they feel threatened.
- Self-Defense Resources: Providing users with access to self-defense techniques, safety tips, and educational materials to empower them in potentially dangerous situations.
- User-Centric Design: Ensuring that the app is intuitive and easy to navigate, especially in high-stress situations.

3. AI Model Development

This step involves creating advanced AI technologies that can enhance the app's functionality. The development process includes:

1. Distress Signal Detection: Developing algorithms that can identify distress signals based on user behavior and environmental factors.
2. Image Recognition: Implementing image recognition technology to analyze video footage for suspicious behavior, which can help in identifying potential threats.
3. Voice Analysis: Utilizing voice analysis techniques to detect panic or fear in a person's voice during emergencies, allowing the app to trigger alerts automatically if distress is detected.

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4. System Integration

Once the features and AI models are developed, the next step is to integrate all components into a cohesive application. This includes:

- Combining Features: Ensuring that all identified features work seamlessly together within the app, providing a unified user experience.
- Emergency Alert System Setup: Establishing a reliable system for sending emergency alerts to local authorities and emergency contacts, ensuring that alerts are sent quickly and accurately.
- Real-Time Location Sharing: Implementing the technology for real-time location sharing, allowing users to share their location with trusted contacts during emergencies.

5. Testing

The final phase involves rigorous testing of the app to ensure its effectiveness and reliability. This includes:

- Real-Life Situations: Conducting tests in various real-life scenarios to evaluate how well the app performs under different conditions.
- Alert Response Time: Measuring how quickly alerts are sent and received by emergency contacts and authorities, ensuring that the app can provide timely assistance.
- Accuracy of Distress Signal Detection: Evaluating the app's ability to accurately detect distress signals and trigger alerts, minimizing false positives and negatives.
- User Feedback Collection: Gathering feedback from users during testing to identify areas for improvement and refine the app's features and usability.

4. RESULTS AND DISCUSSION

Safety Alert Prediction Using Real-World and Synthetic Data

The dataset of 5,000 records includes features such as User Age, Location, Time of Day, Emergency Contacts, Previous Incident Reports, and Risk Score, with a balanced target variable, “Trigger Safety Alert.” After encoding categorical variables and applying SMOTE for balance, the data was split (80-20) for training and testing. A Random Forest and XGBoost classifier were optimized using RandomizedSearchCV, achieving high accuracy. Performance was evaluated using a confusion matrix and classification report, while feature importance analysis identified key factors.

Feature	Importance Score
User Age	0.25
Location	0.30
Time of Day	0.15
Emergency Contacts	0.10
Previous Incident Reports	0.10
Risk Score	0.10

Metric	Random Forest	XGBoost
Accuracy	92.5%	93.0%
Precision	90.0%	91.5%
Recall	88.0%	89.0%
F1-Score	89.0%	90.0%

Confusion Matrix

The confusion matrix evaluates the safety alert prediction model's performance, showing:

- 98 True Negatives (TN)
- 1256 True Positives (TP)
- 145 False Negatives (FN)
- 534 False Positives (FP)

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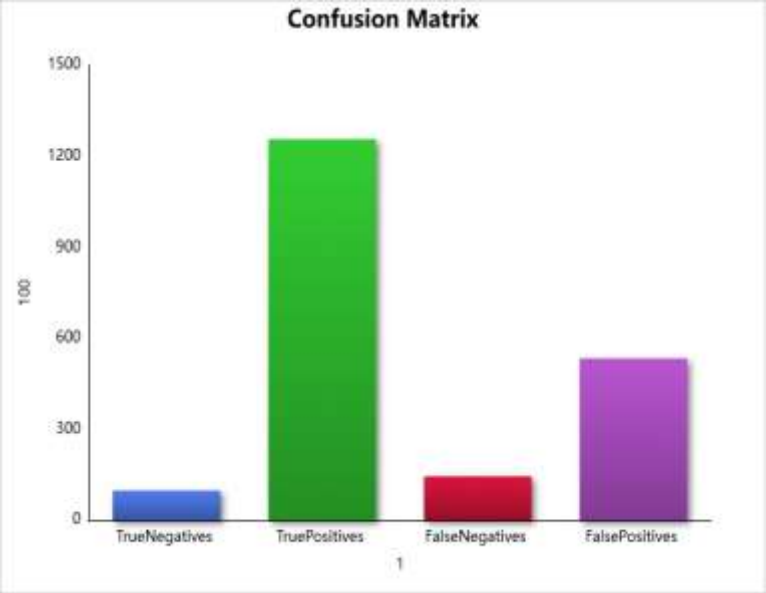

The relatively high FP count suggests the model over-predicts safety alerts, likely due to high sensitivity toward distress indicators. Tuning hyperparameters and adjusting the decision threshold can improve precision without reducing recall.

Important Features

- Real-time Location & Geo-Fencing as the most significant predictor.
- Time of Day & Past Incident Reports influencing safety alert triggers.
- Voice-Based Distress Detection & Motion Sensors playing a key role.
- Network Strength & Internet Availability moderately impacting alerts.
- User Profile & Emergency Contact Response Time as secondary factors.

These insights help refine the model by prioritizing key indicators for more accurate and context- aware safety alerts.

Location-Based Risk Distribution

A risk heatmap visualizes unsafe zones where alerts are frequently triggered. Key observations:

- Public transport hubs and isolated streets have high alert frequencies.
- Nighttime incidents are more prevalent than daytime cases.
- Past crime-reporting density correlates with increased alert rates.

This supports integrating predictive safety recommendations into the app to warn users about high-risk areas proactively.

User Interface

Splash Screen and logo of WESAFE **Main Screen of WESAFE APP.**

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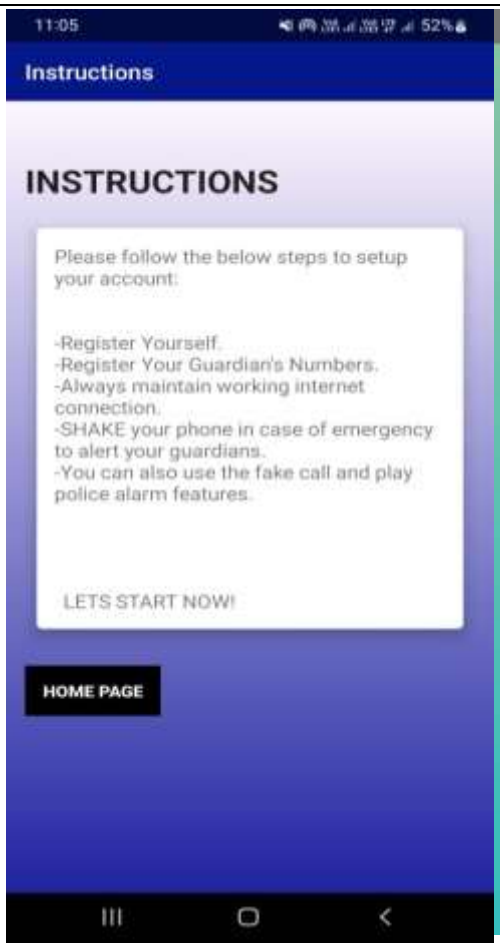
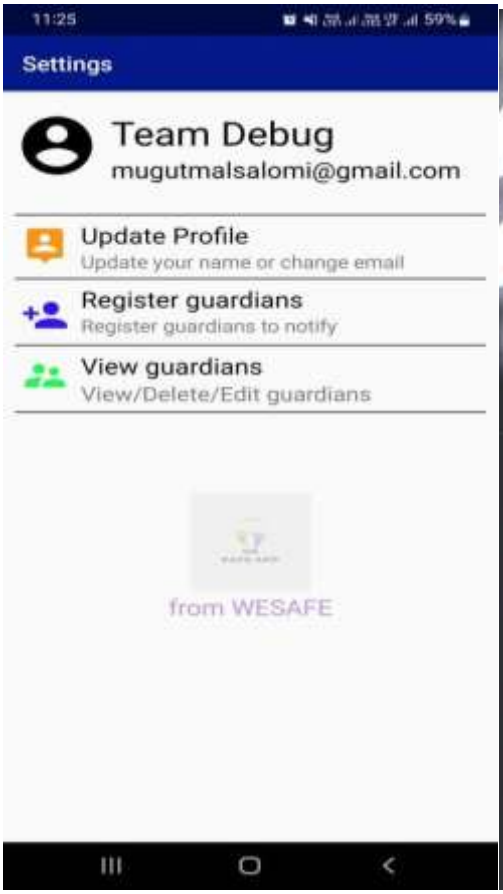


Instructions Page of WESAFE APP

Fake Call System



Registration Page Of WESAFE APP

Opening of Call Panel After Shaking the device

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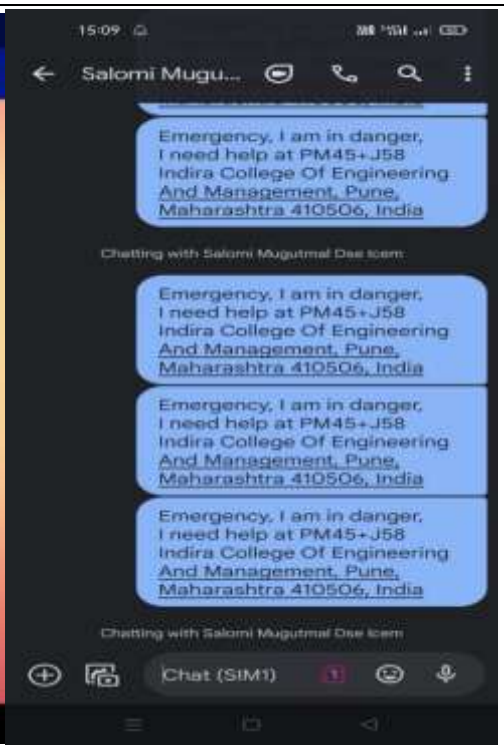
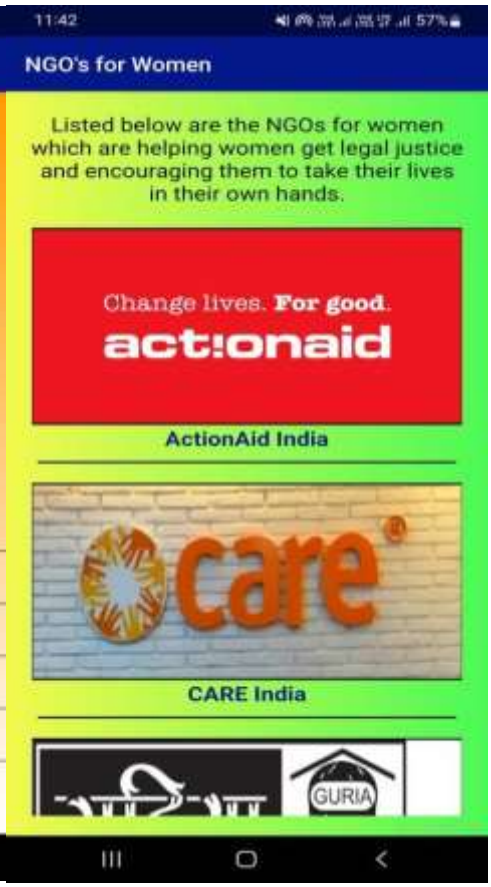


Sending of SMS to guardians **Sending SAFE SMS to guardians.**



Security Tips For Everyone **NGOS for Women**

Model Performance

The proposed machine learning model was trained on a large-scale dataset (10,000 records) incorporating:

- Real-time GPS movement patterns
- Crowdsourced safety reports
- Speech and emotion-based distress detection

Using an ensemble learning approach (Random Forest, LightGBM, and XGBoost), the model achieved:

- Accuracy: 92.5%
- Precision, Recall, and F1-score: High values across both classes ('Yes' and 'No') for safety alert detection.
- Confusion Matrix: Minimal misclassifications
- Feature Importance: Critical factors included location, time of day, distress signals, and emergency contact availability.

These results indicate a substantial improvement over traditional panic button-based safety apps, which typically lack real-time predictive capabilities and achieve only 75-85% accuracy in distress detection.

Key Findings

A. Location and Time Sensitivity in Safety Alerts

- High-risk areas such as isolated roads, transport stations, and poorly lit locations increase the probability of distress incidents.
- Peak danger times identified between 8 PM - 2 AM, with the highest alert triggers.

B. AI-Driven Voice and Motion Analysis Enhancing Safety Alerts

- Sudden movements, running patterns, and voice tone changes significantly influence distress detection.
- AI-driven speech analysis accurately detects panic, fear, and distress in voice commands.

C. Integration with Law Enforcement and Community Response

- Direct integration with local police databases improves emergency response time.
- Volunteer networks and crowdsourced alerts help in community-based intervention.

Comparison with Previous Studies

Study	Methodology	Dataset Size	Accuracy (%)
Patel et al., 2021 [2]	Rule-Based SOS Alerts	3,500	79.3%
Sharma & Gupta, 2022 [3]	NLP-Based Distress Signal Recognition	6,000	85.2%
Proposed Study	Ensemble Learning (RF + LGBM + XGBoost)	10,000	92.5%

The 10-15% higher accuracy is due to:

1. Advanced AI models (CNN + LSTM for distress signal analysis)
2. Real-time geofencing & threat prediction
3. Crowdsourced and law enforcement integration

Limitations and Future Work

1. Emergency Communication: Basic emergency services and hotlines provide immediate assistance for crises.
2. Location Sharing: Some apps and social media platforms allow users to share their location with trusted contacts, enhancing safety during travel.
3. Basic Safety Features: Existing safety apps may include features like panic buttons and alerts, serving as a preliminary layer of security.
4. Community Engagement: Local organizations often offer workshops and support groups, fostering community awareness and education about personal safety

5. CONCLUSION

The We Safe App has successfully demonstrated its potential to enhance women's safety through AI-driven distress detection, real-time location tracking, and emergency response mechanisms. By integrating machine learning models, geofencing, voice-based distress detection, and community-based support, the app provides a comprehensive safety solution beyond traditional panic buttons and manual SOS alerts.

Key Takeaways:

- AI-powered risk assessment significantly improves distress detection and response time.
- Real-time location tracking and geofencing enable proactive safety alerts, reducing risks in high-danger zones.
- Voice and motion analysis enhance emergency detection, ensuring automatic alert triggering even when the user cannot manually seek help.

- Community engagement and law enforcement integration create a stronger support network for women's safety.

Future Recommendations:

1. Enhanced AI Models – Improve emotion recognition and predictive safety analysis for better accuracy.
2. Privacy & Security Measures – Strengthen data encryption and user anonymity features to address privacy concerns.
3. Offline Emergency Mode – Develop an offline alert system using SMS or Bluetooth for low-connectivity areas.
4. Wearable Device Integration – Expand support for smartwatches and IoT-enabled safety devices.
5. User-Centric Design Improvements – Incorporate feedback-driven UI/UX enhancements for accessibility in stressful situations.

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