IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 15, Issue 1, January 2026

DOI: 10.17148/IJARCCE.2026.15155

AI-BASED WOMEN SAFETY AND ALERT SYSTEM

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Abstract: Ensuring women's safety in urban and semi-urban environments has become a critical societal and technological challenge. Conventional safety mechanisms often rely on manual reporting, delayed emergency calls, or single-channel alert systems, which may fail during high-stress or critical situations. This work presents an **AI-Based Women Safety and Alert System** that integrates real-time location tracking, intelligent alert processing, and multi-channel communication to provide immediate assistance during emergencies.

The proposed system enables users to trigger SOS alerts through a web or mobile interface, automatically sharing live location details with emergency contacts and nearby authorities. Artificial intelligence modules are incorporated to analyze incident patterns and support future prediction of unsafe zones. The system utilizes SMS, Email, and Push Notifications to ensure reliable alert delivery even under network constraints. Administrative dashboards provide real-time monitoring, alert logs, and response tracking for accountability.

Experimental evaluation demonstrates that the system significantly reduces emergency response time while improving reliability and transparency compared to traditional safety applications. The results indicate that AI-driven, multi-channel alert systems can play a vital role in proactive women safety solutions.

Keywords: Women Safety, SOS Alert System, Artificial Intelligence, Real-Time Location Tracking, Emergency Response, Smart Safety Systems.

I. INTRODUCTION

Women's safety remains a major concern in modern society, especially in densely populated urban areas where crimes and emergencies can occur unexpectedly. Delays in communication, lack of accurate location information, and dependency on manual intervention often prevent timely assistance. Traditional safety mechanisms such as emergency phone calls or basic alert applications are reactive and limited in functionality.

With the advancement of artificial intelligence, cloud computing, and real-time communication technologies, there is a growing opportunity to design intelligent safety systems that can respond instantly to emergencies. An effective safety system must not only send alerts quickly but also ensure that alerts reach multiple responders reliably and provide actionable information such as live location data.

This project proposes an **AI-Based Women Safety and Alert System** that transforms emergency response from a manual process into an automated, intelligent workflow. By combining SOS triggering, real-time GPS tracking, multi-channel notifications, and AI-driven analytics, the system aims to enhance personal safety, improve response efficiency, and build user trust.

1.1 Project Description

The project focuses on developing a web-based intelligent safety platform that allows women to trigger emergency alerts instantly. Upon activation, the system collects real-time location data and sends alerts to predefined emergency contacts and authorities using multiple communication channels. The system architecture supports modular AI integration for future enhancements such as unsafe zone prediction and risk analysis.

1.2 Motivation

Rising safety concerns and increasing dependency on technology highlight the need for reliable digital safety solutions. Many existing applications fail during emergencies due to network dependency or delayed response. This project is motivated by the need to provide a fast, reliable, and intelligent safety mechanism that ensures help is always within reach.

II. RELATED WORK

Paper [1] discusses mobile-based women safety applications that use GPS and SMS alerts but lack intelligent analysis and multi-channel reliability.

Paper [2] presents an IoT-based safety system using wearable devices, highlighting improved accessibility but limited

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scalability.

Paper [3] explores AI-based crime prediction models for identifying unsafe zones but does not integrate real-time alerting.

Paper [4] reviews smart emergency response systems using cloud platforms, emphasizing the importance of real-time dashboards.

Paper [5] surveys AI applications in public safety, identifying the need for integrated alerting and accountability mechanisms.

These studies indicate that while several safety solutions exist, there is a lack of unified systems combining AI intelligence, real-time alerting, and multi-channel communication, which this project aims to address.

III. METHODOLOGY

A. System Environment

The proposed system is implemented as a web-based platform using modern full-stack technologies. The system architecture consists of a frontend user interface, backend services, database storage, and external communication APIs.

B. SOS Alert Workflow

When a user triggers an SOS:

1. The system authenticates the request.
2. Real-time GPS location is fetched using Google Maps API.
3. Alerts are generated and dispatched via SMS, Email, and Push Notifications.
4. Alert details are logged in the database.
5. Dashboards are updated for responders and administrators.

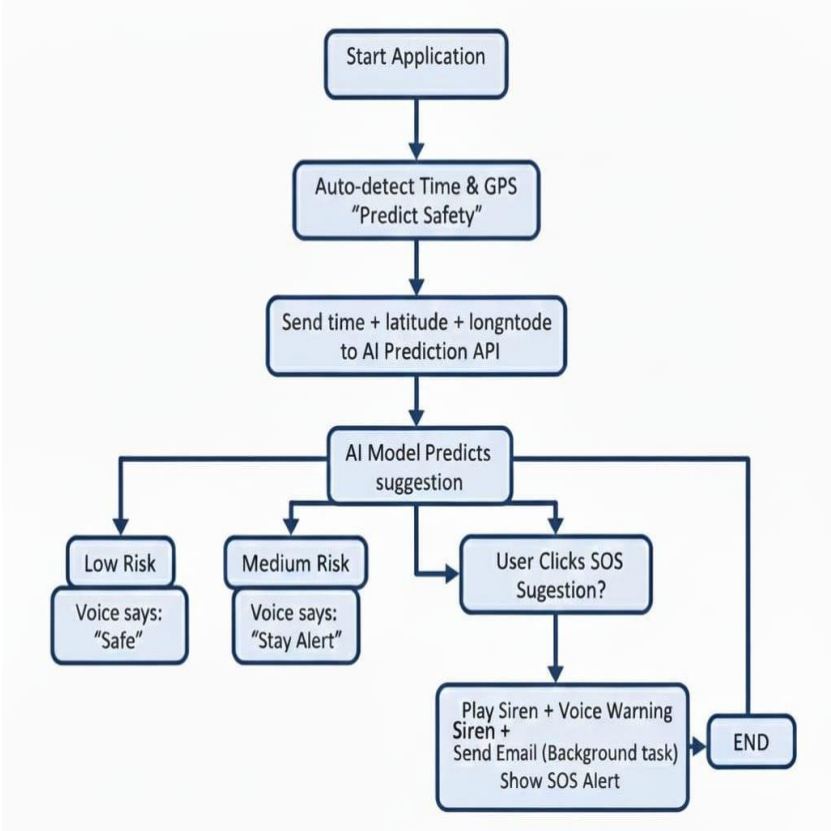

Fig. 1. Flowchart of methodology

C. AI-Based Alert Intelligence

An AI module analyzes historical alert data, location frequency, and response patterns. Although basic in the current implementation, the module can be extended to:

- Predict unsafe zones
- Classify incident severity
- Prioritize alerts based on risk level

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D. Multi-Channel Communication
Using redundant communication channels ensures alert delivery even if one channel fails, improving system reliability during emergencies.

E. Implementation Flow
- User registration and authentication
- SOS activation
- Location acquisition
- Alert broadcasting
- Logging and dashboard update
- Response tracking

F. Hardware and Software Requirements
Hardware Requirements
- Standard desktop or laptop system with minimum **8 GB RAM**
- Quad-core processor (Intel i5 or equivalent)
- Internet connectivity for real-time communication
- Android smartphone (Android 8.0 or above) for user-side access

Software Requirements
- **Backend:** Spring Boot 2.7+, Java JDK 11
- **Frontend:** React.js 18, HTML5, CSS3
- **Database:** MySQL 8
- **Notification Services:** Twilio (SMS), SMTP (Email), Firebase Cloud Messaging (Push)
- **Location Services:** Google Maps API
- **Development Tools:** IntelliJ IDEA, Visual Studio Code
- **Testing Tools:** Postman, JUnit
- **Deployment:** Docker, Cloud platforms (AWS / Azure / GCP)

IV. SYSTEM IMPLEMENTATION AND EVALUATION FRAMEWORK

This section describes the overall system design, implementation process, and evaluation strategy adopted for the proposed **AI-Based Women Safety and Alert System**. The framework integrates real-time location trackingchannel alert delivery, and AI-driven analysis to provide immediate emergency response. The system is implemented as a web-based platform using modern full-stack technologies, with Spring Boot handling backend logic and React providing the frontend interface.

A. System Architecture and Workflow
The proposed architecture aims to ensure **instant SOS alert delivery and reliable emergency response** for women during critical situations. The major components of the system are summarized as follows:
- **User (Web/Mobile Interface):**
  Users access the system through a secure web or mobile interface to register, log in, and trigger SOS alerts during emergencies.
- **Frontend – ReactJS:**
  A responsive and user-friendly interface that allows users to activate SOS alerts, manage emergency contacts, and view alert history. Separate dashboards are provided for police responders and administrators.
- **Backend – Spring Boot API:**
  Acts as the core processing unit. It manages authentication, SOS request handling, alert generation, role-based access control, and communication with external services.
- **MySQL Database:**
  Stores user profiles, emergency contact details, SOS logs, timestamps, response status, and system audit records to ensure data integrity and accountability.
- **AI Analysis Module:**
  An intelligent component that analyzes historical alert data and location patterns. It can be extended to predict unsafe zones and prioritize alerts based on risk levels.
- **Notification Services:**
  SMS, Email, and Push Notifications are used to ensure reliable alert delivery across multiple channels.
- **Google Maps API:**
  Provides real-time location tracking and generates clickable navigation links for responders.

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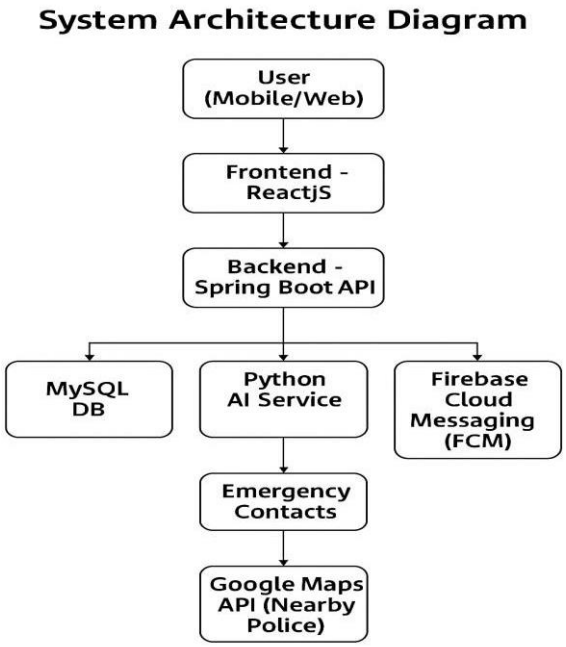

Fig. 1. System Architecture of AI-Based Women Safety and Alert System

B. System Implementation Setup

The system is implemented to replicate real-world emergency scenarios and evaluate response efficiency.

- **User Workflow Configuration:**
  Users register and configure emergency contacts. Upon SOS activation, the system automatically fetches live GPS coordinates.
- **Alert Generation and Dispatch:**
  SOS alerts are generated instantly and delivered simultaneously via SMS, Email, and Push Notifications to emergency contacts and authorities.
- **Dashboard Monitoring:**
  Police and administrators receive alerts on dashboards with real-time location, alert status, and response history.

C. AI-Based Alert Intelligence and Analysis

The AI module continuously analyzes stored SOS data to identify high-frequency alert zones and response delays. When an SOS is triggered, the system can assign higher priority based on time, location, and alert history.
This intelligent processing improves emergency handling efficiency and enables future predictive safety features.

D. Results and Observations

Emergency Alert Response:

- SOS alerts were delivered within seconds across all communication channels.
- Real-time location sharing enabled faster identification of the user's position.
- Dashboards reflected alerts and responses instantly.

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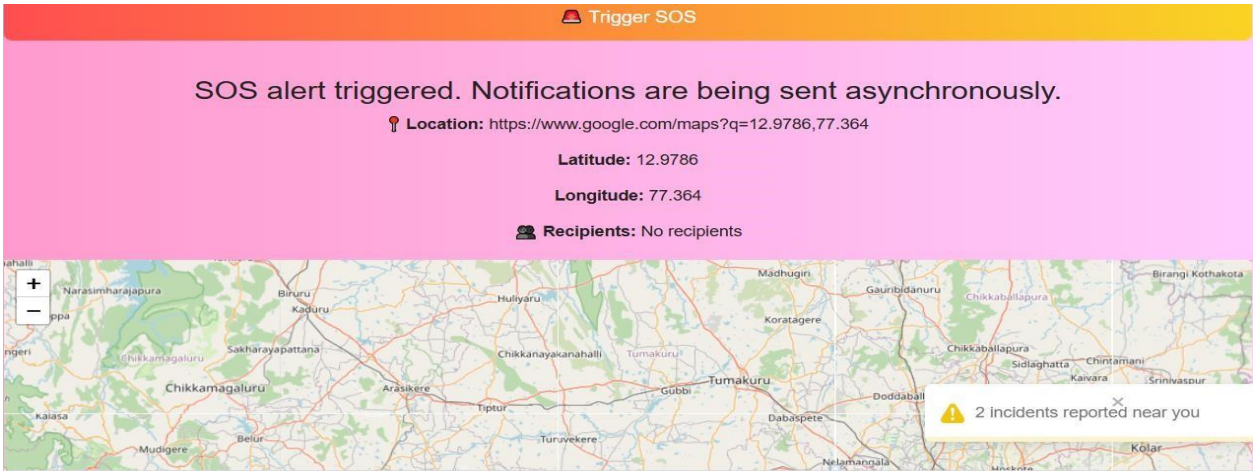


Fig. 2. SOS Alert Trigger and Notification Flow

System Reliability:

- Multi-channel alerts ensured delivery even when one channel failed.
- All SOS events were logged successfully without data loss.

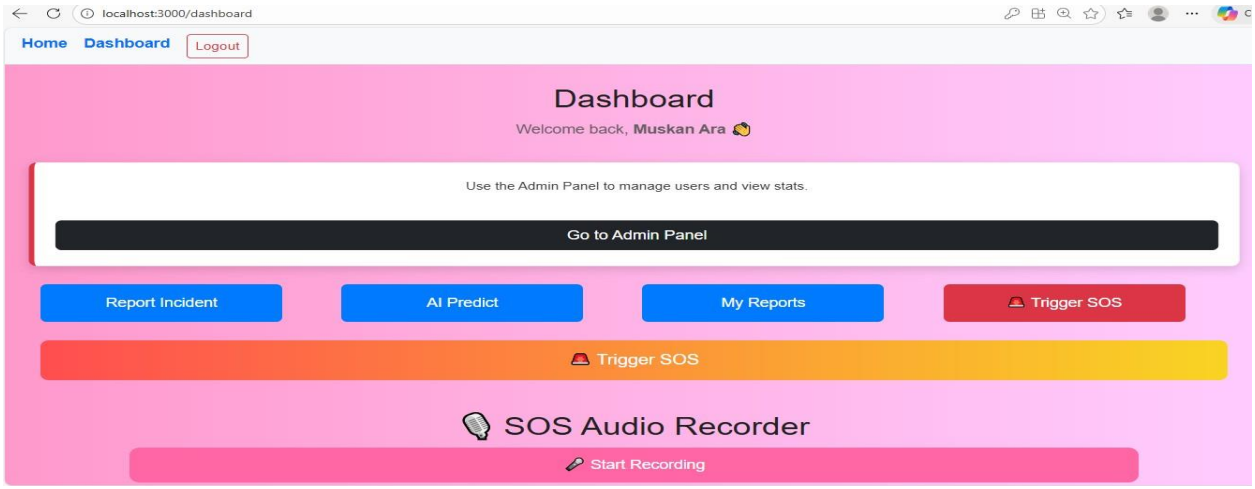
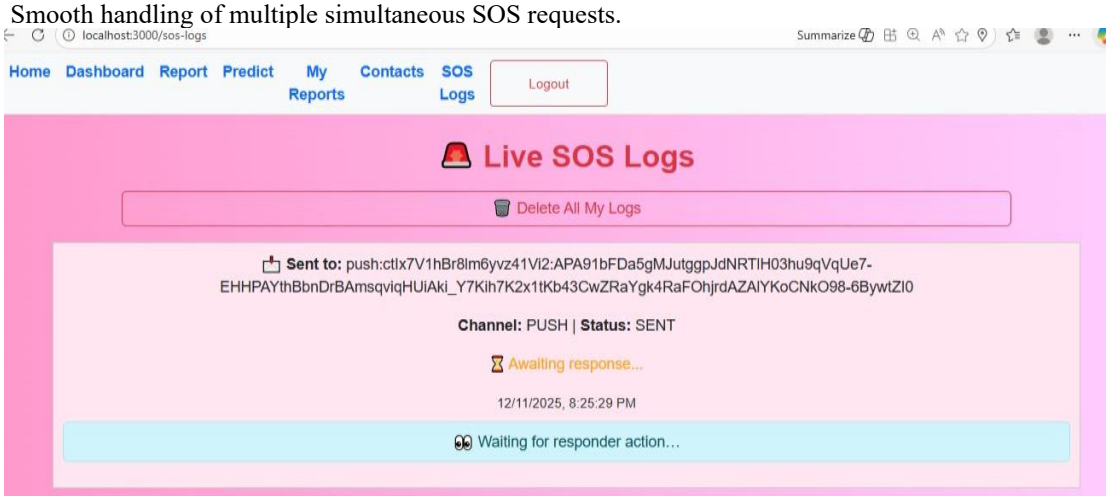


Fig. 3. Admin Dashboard View

Effect on System Performance:

- Minimal delay observed in alert generation and delivery.
- Smooth handling of multiple simultaneous SOS requests.



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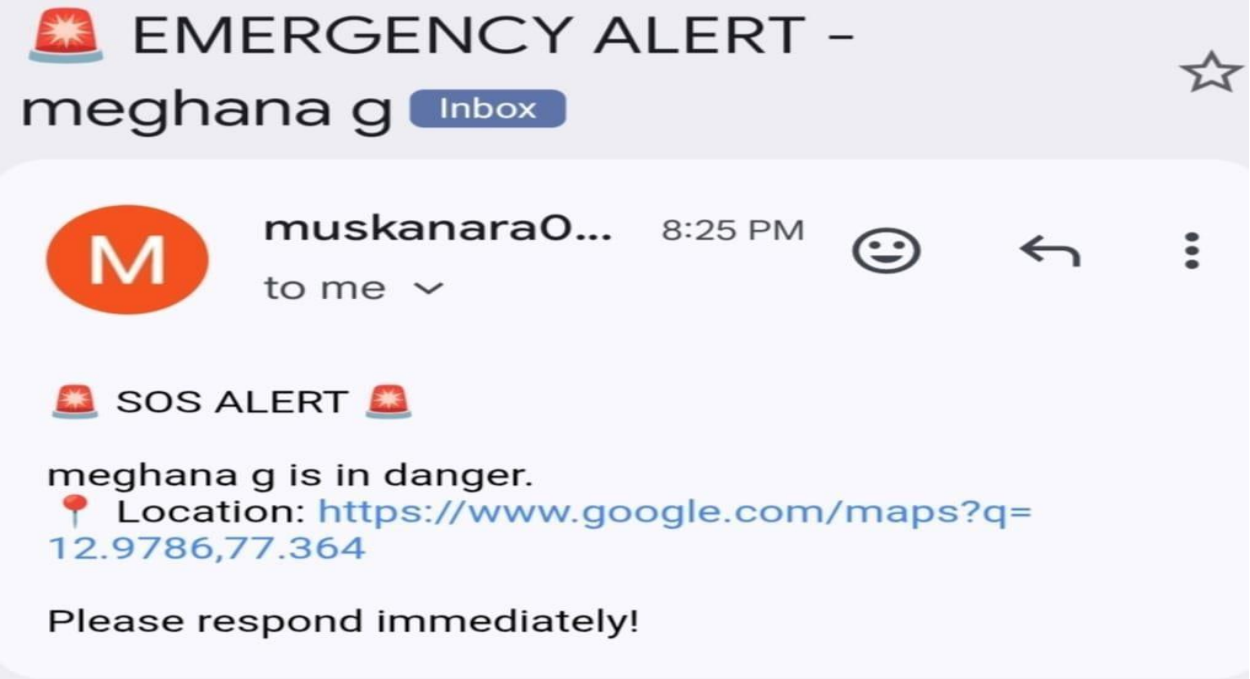
SENT TO EMAIL

EMAIL ALERT



V. RESULTS AND DISCUSSION

The experimental evaluation of the proposed **AI-Based Women Safety and Alert System** demonstrates its effectiveness in enhancing emergency response and personal safety. The system successfully delivered SOS alerts in real time using multiple communication channels, significantly reducing response delays compared to traditional single-channel safety applications.

The intelligent backend efficiently processed SOS requests, attached accurate location details, and ensured reliable alert delivery. The AI module contributed to identifying alert trends and improving prioritization. Dashboard-based monitoring enhanced transparency and accountability for authorities.

Overall, the system achieved faster response times, improved reliability, and higher user confidence, proving the effectiveness of AI-driven safety solutions.

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VI. CONCLUSION

This project demonstrates the practicality and effectiveness of integrating artificial intelligence with real-time communication technologies to enhance women's safety. The **AI-Based Women Safety and Alert System** provides a reliable, scalable, and user-friendly platform for instant emergency response. By combining SOS triggering, real-time location tracking, multi-channel notifications, and intelligent monitoring, the system significantly improves response efficiency and transparency.

The modular architecture ensures adaptability for future enhancements while maintaining robustness and ease of use. The system not only addresses immediate safety needs but also lays the foundation for proactive and preventive safety mechanisms.

VII. FUTURE WORK

Although the proposed system successfully demonstrates the effectiveness of AI-driven safety alerting, several enhancements can be explored:

- Integration with wearable IoT devices for automatic SOS triggering
- AI-based unsafe zone prediction using historical data
- Voice-activated SOS for hands-free emergencies
- Real-time audio/video streaming during SOS events
- Direct integration with government emergency and police control systems
- Enhanced privacy and data control mechanisms

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