

AI POWERED SAFETY ALERT SYSTEM FOR REAL TIME THREAT DETECTION

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Big Data, Artificial Intelligence, and Data Engineering for Security and Assistive Aid.

Introduction:

Emergencies and threats are an inevitable part of life, ranging from personal crises such as medical emergencies or physical threats to larger-scale issues like natural disasters or security concerns. With the proliferation of smartphones and the advent of artificial intelligence (AI) technologies, there is immense potential to create solutions that not only detect such emergencies but also facilitate rapid responses to mitigate their effects. One such promising application is the **AI Powered Safety Alert System for Real Time Threat Detection** designed to identify, analyze, and respond to potential threats in real time.

The motivation for this project arises from the increasing need for advanced safety systems that integrate seamlessly into daily life. Despite the availability of emergency services, there are significant gaps in timely threat detection and communication. Traditional approaches such as manual calls to emergency services or reliance on bystanders often lead to delays in response times. These delays can be detrimental, especially in critical situations where every second counts.

This project leverages Natural Language Processing (NLP) and mobile computing to build a robust and intelligent system capable of analyzing text and voice inputs to detect emergencies. By focusing on user-provided contextual data, such as phrases

like "help," "fire," or "accident," combined with location data and user preferences the app ensures timely and accurate threat detection.

The architecture of the application is divided into multiple layers, including a user-friendly interface, a backend with NLP-based threat detection algorithms and a response system integrated with GPS and communication tools. The application provides functionalities such as notifying emergency contacts, sending SOS messages with real-time location and offering recommendations for immediate action based on the nature of the detected threat.

In an era where digital solutions are becoming integral to our lives, this application addresses a critical gap in emergency management. It empowers individuals by providing them with a tool for ensuring personal safety and enables faster coordination with emergency services.

Objectives:

- Enable users to send real-time emergency alerts with voice commands or in-app buttons, instantly notifying contacts and services with their location.
- Use AI to analyze voice, motion, and sensor data to detect emergencies like falls or distress, and trigger alerts even when users can't.
- Integrate AI support that recognizes urgent voice cues and evolves through user feedback to enhance reliability and user experience.
- Secure all personal data—location, contacts, and feedback—with strong encryption and controlled access to ensure privacy during emergencies.

Methodology:

1. Provide Immediate Assistance in Emergency Situations

Step 1: Develop UI for Emergency Activation: Create an intuitive user interface where users can quickly initiate an emergency alert. Include buttons for direct activation and voice command triggers.

Step 2: Set Up Location and Contact Sharing: Implement functionality to capture and share the user's real-time location, as well as pre-selected emergency contacts who will receive alerts.

Step 3: Integrate Communication Channels: Enable the app to send emergency messages via SMS, push notifications, or email to both contacts and emergency services.

Step 4: Implement Real-Time Tracking and Notifications: Design a system to continuously update emergency contacts with the user's live location and any changes in the situation until help arrives.

2. Enhance User Safety through Advanced Threat Detection

Step 1: Incorporate AI for Voice Analysis: Use speech-to-text and natural language processing (NLP) algorithms to detect distress in a user's voice commands or patterns, automatically initiating an alert if distress is detected.

Step 2: Integrate Sensor Data for Fall Detection: Utilize smartphone sensors (e.g., accelerometer, gyroscope) to recognize abnormal movements or falls, triggering an alert if a potential accident is detected.

Step 3: Implement Machine Learning Models: Train and deploy models to analyze user behavior patterns and detect irregularities that may signal an emergency.

Step 4: Continuous Testing and Refinement: Continuously test and refine the AI models to improve accuracy and reduce false positives in emergency detection.

3. Improve User Experience with Chatbot Support and Feedback Integration

Step 1: Develop an In-App Voice recognition for Assistance: Build an AI-powered Voice recognition during emergencies and provide quick responses to trigger SOS instructions.

Step 2: Enable Feedback Collection: Add options for users to provide feedback after each emergency event or interaction, capturing valuable data on the app's performance and areas for improvement.

Step 3: Store Feedback in a Secure Database: Design a database schema to securely store user feedback data for later analysis and development insights.

Step 4: Analyze Feedback to Improve User Experience: Regularly analyze the feedback to identify trends and areas of improvement, updating the app's features or chatbot responses as needed.

4. Ensure Data Security and Privacy for User Information

Step 1: Implement Data Encryption for User Information: Use encryption methods to protect sensitive user data, such as contact information, location, and feedback.

Step 2: Set Up Access Controls and Authentication: Enforce access control mechanisms to restrict unauthorized access to the app's database, ensuring only the user and authorized services can access data.

Step 3: Comply with Data Privacy Regulations: Ensure that the app adheres to data privacy laws (e.g., GDPR, CCPA) by allowing users to control their data and providing clear data usage policies.

Step 4: Perform Regular Security Audits: Conduct periodic security checks and audits to identify potential vulnerabilities and ensure the app remains secure and compliant with privacy standards.

Result and Conclusion:

Efficient emergency assistance with a mobile application capable of providing real-time alerts triggered by voice commands or app interaction. Timely notifications sent to emergency contacts and authorities, including details like location, photos, and contextual information. Enhanced safety through AI-powered voice recognition to detect distress phrases like "Help me," enabling alerts even when manual input is not possible. Multi-channel communication via email, and push notifications to ensure all relevant parties are informed promptly. Secure handling of user data with encryption and access control measures, ensuring privacy and compliance with data protection laws. A user-friendly interface to facilitate quick activation of emergency features and provide an improved user experience. A positive social impact by enhancing personal safety and emergency preparedness for individuals and communities

Welcome Back

Email
Password

LOGIN

[Don't have an account? Register](#)

Figure 1: Login Page

If you feel threatened, call out HELP ME!

EMERGENCY

I NEED HELP, PLEASE RESPOND URGENTLY!

I'M IN DANGER, PLEASE SEND HELP!

PLEASE TRACK MY LOCATION FOR SAFETY.

ALERT! I NEED IMMEDIATE ASSISTANCE.

Or type your custom message

SEND CUSTOM MESSAGE

Figure 2: Sign Up Page

Create Account

Name
Email
Phone
Password
Confirm Password

REGISTER

[Already have an account? Login](#)

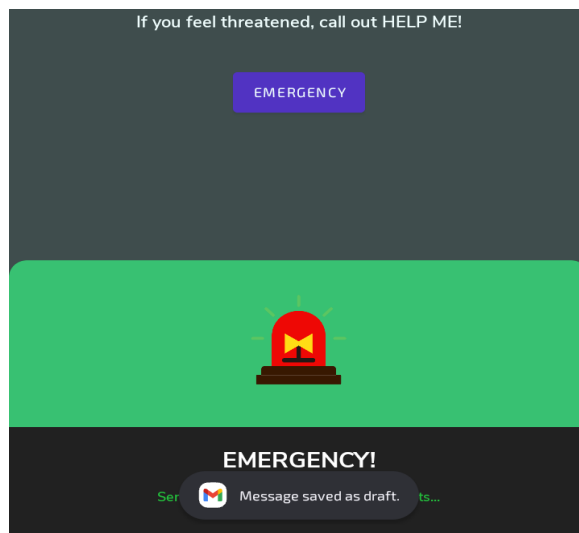
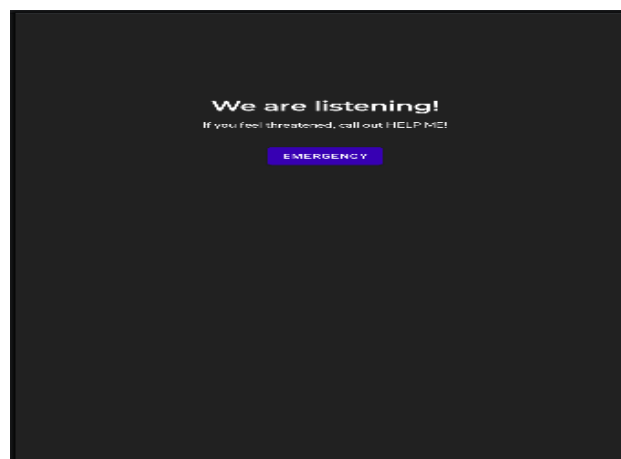
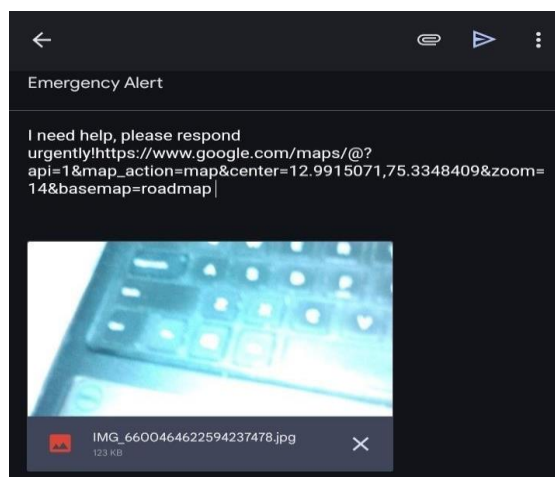


Figure 5: Emergency triggered

Figure 6: Redirected to Email Page



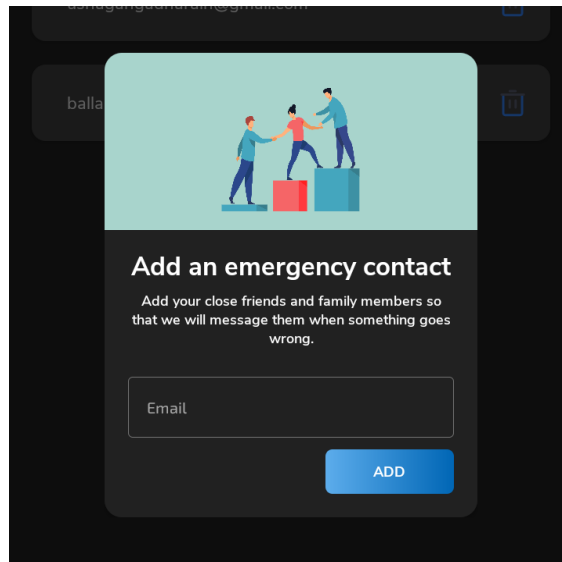


Figure 7: Add Contact Page

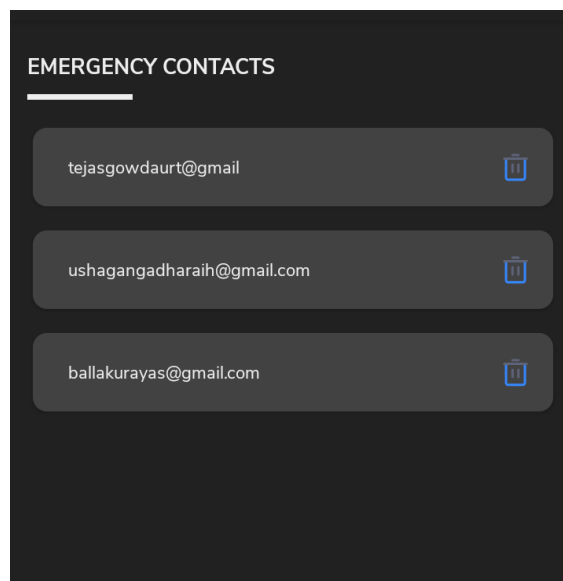


Figure 8: Emergency Contact List Page

Project Outcome & Industry Relevance:

The AI-powered safety alert system successfully delivered a functional and reliable emergency response application. By allowing users to trigger alerts through a simple voice command like “help me,” the app demonstrated its effectiveness in reducing response time during critical situations. The system integrates real-time location sharing and automatic notifications to pre-selected emergency contacts, making it highly practical and user-centric. From an industry perspective, this solution holds significant relevance in sectors such as personal safety, healthcare, security, and smart city development. With the growing demand for AI-driven safety solutions,

especially in public safety and vulnerable population support, this project addresses real-world needs with a scalable and impactful approach. Its ease of use, focus on privacy, and practical deployment potential make it well-aligned with current industry trends in emergency response technologies.

Working Model vs. Simulation/Study:

- The project involved the development of a fully functional **mobile/web app**, not just a theoretical concept or simulation.
- It features **real-time voice command recognition** ("help me") to trigger emergency alerts, showcasing live interaction capabilities.
- The system includes **working modules** such as user on-boarding, contact selection, voice-based alert triggering, and real-time location sharing.
- The complete solution was **implemented, tested, and demonstrated** under real-world conditions, confirming its reliability as a working model rather than a simulated prototype.

Project Outcomes and Learnings:

Key Outcomes:

- Successfully implemented voice-triggered emergency alerts using the phrase "help me" for quick and easy user activation.
- Enabled real-time location sharing and instant notifications to emergency contacts through the app.
- Simplified user interaction during emergencies with a minimal, voice-based input system.
- Collected valuable user feedback to improve the app's functionality, accuracy, and responsiveness.
- Ensured secure handling of sensitive user data with strong encryption and controlled access.

Key Learnings:

- Simple voice inputs like "help me" can effectively trigger emergency alerts, making the app accessible and quick to use under stress.

- AI-driven threat detection within the app enhances response time by identifying emergencies even when the user can't interact manually.
- Real-time location sharing and instant alerts to emergency contacts improve user safety during critical moments.
- User feedback plays a crucial role in refining AI accuracy, reducing false positives, and ensuring the system works across varied real-life scenarios.
- Ensuring end-to-end encryption and data control within the app builds user trust while protecting sensitive information.

Future Scope:

While the application successfully meets its current goals, there is significant potential for future enhancements, such as:

1. Integration with Wearable Devices: Expanding functionality to smartwatches and fitness trackers for broader accessibility.
2. Multilingual Support: Enhancing NLP models to recognize distress phrases in multiple languages, increasing global usability.
3. AI-Driven Insights: Incorporating machine learning to analyze user behavior patterns and predict emergencies proactively.
4. Cloud-Based Scalability: Leveraging cloud services for better scalability and more robust data storage and analytics