AI Based Safety App

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***Abstract*—The increasing concern for safety in our country is leading to the development of many solutions to improve security. This paper provides the design of an AI based safety app that includes many features to tackle tough situations and provide real-time assistance. This app allows users to create their own daily schedule and live track them based on their daily routine, the app also holds the feature of an AI voice command system, which is used in emergencies as it triggers emergency alerts and shares their live location through simple voice commands. The system also features a consultation tab, where users can consult with professionals about their concerns. Lastly, the app also features a small hardware device similar to that of an Apple Air Tag, which will also track the user's location in real time and provide emergency alerts. The research portrays the potential of the software to improve safety and provide peace in our nation.**

***Index Terms*—AI-based safety application,Personal safety technology,Real-time location tracking,Emergency alert system,Voice-activated safety features,Mobile safety solutions,GPS-based safety tracking,Hardware integration for security,AI-driven emergency response, Deep Learning, Safety, Consultation features, Real-time notifications for safety.**

I. Introduction

Safety concerns are growing as individuals face risks such as accidents, health emergencies, and crime. Traditional safety measures often fail to provide real-time assistance, highlighting the need for smarter, tech-driven solutions.

This paper presents an AI-based safety app with features such as live location tracking, emergency alerts, and voice commands. Users can set routines, and if any deviation occurs, the app notifies assigned contacts with GPS data. The voice command system allows users to send emergency signals and share their location in a hands-free manner.

The app also integrates with a portable device, similar to Apple's AirTag, for continuous location tracking. By combining AI, GPS, voice commands, and hardware, the app offers a comprehensive safety solution. The paper discusses its design, technology, and potential impact on user safety.

II. Ease of Use

A. User Interface and Design Integrity

From the very beginning, we focused on making the app as easy to use as possible, especially considering that it is intended for emergency situations. In moments of stress, users need to act quickly, so the interface was designed to be simple and intuitive. We opted for large, clearly labeled buttons and minimized unnecessary menus to make navigation straightforward. Features such as sending a live location, triggering emergency alerts, and accessing the daily schedule are all within one or two taps, ensuring that even first-time users can quickly get the hang of it.

To ensure accessibility, the app supports voice commands for users who may not be able to interact directly with their phones, and uses legible fonts and color schemes that are easy to read under various lighting conditions. The overall design aims to reduce cognitive load, allowing users to focus on staying safe rather than figuring out how the app works.

As the app uses advanced AI in the background, such as to monitor user activity and detect potential emergencies, the user does not need to interact with or configure any of these features. Everything runs silently in the background, helping to detect irregularities or send alerts without user intervention. This non-intrusive integration of AI allows the app to operate effectively while ensuring that the user experience remains smooth and uninterrupted.

The app was also tested on real-world scenarios to ensure that the most critical features work reliably when needed the most. Whether it is during a moment of panic or a regular routine check, the app responds quickly and accurately. With these design choices, our goal was to create a tool that blends powerful functionality with user-centered simplicity, ensuring that it meets the needs of its users in both routine and emergency situations.

III. Related Work

Several technologies aim to enhance personal safety, but few offer a real-time, AI-driven solution like the one presented here. Existing solutions can be categorized as:

- Location Tracking: Apps such as Life360 share location but rely on manual updates, not continuous tracking.
- Emergency Alerts: Apps such as bSafe require user interaction, which isn't always possible in emergencies.
- Wearable Devices: Devices such as AirTag track locations but focus on lost items rather than personal safety.
- AI Solutions: Some apps use AI to detect unusual behavior and potential threats.

Our solution combines AI, real-time tracking, voice alerts, and hardware for a hands-free, comprehensive safety system.

IV. System Architecture

The architecture of our AI-Based Safety App is designed to bring together mobile technology, artificial intelligence, and cloud services in a way that enhances user safety in real-time. We've built the system in a modular way so that each part does its job efficiently while staying connected with the others.

A. Overview

The app is organized into several core layers:

- The user interface for interaction
- The core mobile logic that handles app functions
- An AI layer for smart features like voice detection and scheduling
- A cloud backend for real-time data and authentication
- Integration with a custom safety device
- A communication system for emergencies

B. Key Components

1. User Interface

We used Flutter to design a simple and user-friendly interface. The main screens include emergency options, live tracking, consultation services, and an AI-powered planner. Accessibility and speed were our top priorities.

2. App Logic (Mobile Layer)

This is the heart of the app, where voice commands are picked up, schedules are tracked, and user actions are monitored. It also manages GPS data and Bluetooth connections with the safety device.

3. AI and Scheduling Features

The app uses voice recognition to detect distress phrases. If a trigger word is spoken, the app quickly initiates emergency actions. The AI scheduler also keeps track of the user's daily routine and sends alerts if a planned task is missed, possibly indicating trouble.

4. Cloud Backend

Using Firebase, we store user data securely and handle login, notifications, and emergency events. All sensitive operations are managed in the cloud to ensure fast and reliable performance.

5. Hardware Integration

We're also connecting a small, portable device (like an AirTag) to the app via Bluetooth. This device can share the user's location continuously in emergencies, even if the phone isn't directly accessed.

6. Emergency Communication

When the app detects a problem, it immediately sends alerts. These can be in the form of messages, notifications, or automatic calls to saved emergency contacts. The system is built to work even if the internet connection is weak.

C. How Everything Works Together

Here's how the process usually flows:

1) The user sets up their schedule and emergency contacts.
2) The app runs in the background, monitoring activity and listening for distress words.
3) If something seems off—like a missed appointment or a triggered phrase—the app collects the user's location and starts the emergency protocol.
4) This information is sent to family or authorities, and live tracking is activated.
5) All data is saved securely on the cloud.

D. Architecture Diagram

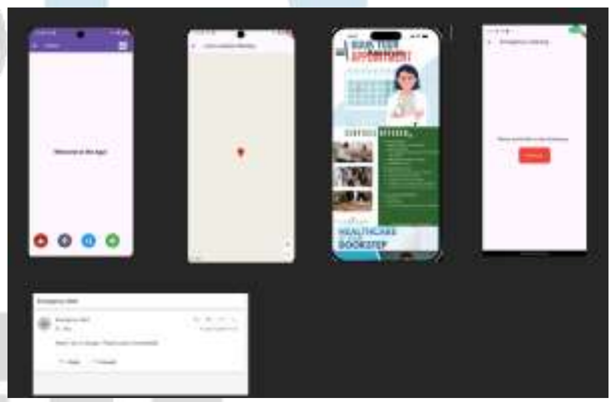

Fig. 1. System Architecture of the AI-Based Safety App

V. Methodology

The development of the AI-based safety application is being carried out in stages. Our focus has been on building a strong foundation by developing core safety features first and then gradually integrating additional modules. The process combines mobile development, cloud integration, and AI features tailored for real-life emergency situations.

A. Initial Planning and Requirement Analysis

We began by identifying the key safety concerns faced by women in day-to-day life. These included the inability to quickly communicate in emergencies, lack of real-time tracking, and the absence of a reliable alert mechanism. Based on these concerns, we outlined the core features and decided on a phase-wise development model.

B. Technology Selection

We chose Flutter for app development due to its cross-platform capabilities and smooth performance. Firebase was selected for real-time database, authentication, and cloud messaging. For future AI integration, we have researched speech recognition libraries that can run efficiently on mobile devices.

C. Work Completed So Far

At the current stage, the following components have been successfully implemented:

- **Live Location Tracking:** Users can share their real-time location, which is updated continuously and securely stored using Firebase.
- **Basic UI Design:** A functional and clean user interface has been created, allowing smooth navigation between screens such as emergency contact setup, tracking, and consultation.
- **Emergency Notification System:** An initial version of the notification system is in place, allowing alerts to be sent to predefined contacts.

D. Work Under Development

Some of the key features currently being developed include:

- **Voice Command Trigger:** We are testing voice detection methods to allow users to activate emergency actions using spoken keywords.
- **AI-Powered Scheduler:** A module is being developed to allow users to create daily routines, with automatic alerts triggered when scheduled tasks are missed.
- **Consultancy Tab:** We are in the process of designing a secure interface for users to connect with doctors, safety officers, or counselors via text or call.

E. Planned Future Enhancements

Some features are in the planning stage and will be added in upcoming development cycles:

- **Hardware Integration:** We plan to link the app with a small wearable device via Bluetooth to enhance tracking accuracy even when the phone is not accessible.
- **Payment Integration:** A payment gateway will be added for consultancy sessions with verified professionals.
- **Offline Functionality:** We aim to make key emergency features functional even without a stable internet connection.

F. AI Model Architecture and Implementation

The AI-based features in our Flutter application are designed to run efficiently on mobile devices using TensorFlow Lite, a lightweight version of TensorFlow optimized for on-device inference.

1) Voice Command Detection (On-Device): To detect distress calls like "Help" or "Save me," we train a Convolutional Neural Network (CNN) using the Google Speech Commands dataset.

Once trained, the model is converted to the TensorFlow Lite format (.tflite) and integrated into the Flutter app using the ”`tflite_flutter`” plugin. This allows the model to run directly on the user's device with low latency and no dependency on cloud services.

2) Routine Behavior Monitoring (Server-Side / Hybrid): To better understand users' daily habits and spot possible emergencies—like missed check-ins or unusual activity—we're using an LSTM (Long Short-Term Memory) model. This model learns from patterns in user behavior and location data. Since it's a complex system that needs a lot of data, we run it on a secure backend server and let other services interact with it through RESTful APIs.

The model monitors sequences of GPS locations and timestamps to detect deviations from normal patterns. When anomalies are detected, alerts are sent to the app for further action.

3) Frameworks and Toolchain:

- **Model Development:** TensorFlow and Keras (Python)
- **Model Conversion:** TensorFlow Lite Converter
- **Flutter Integration:** `tflite_flutter` and `tflite` plugins
- **Voice Preprocessing:** Spectrogram or MFCC feature extraction using Dart or native plugins
- **Inference Type:** Voice command detection runs on-device; behavioral anomaly detection may run on server for extended learning capabilities

This hybrid approach balances real-time responsiveness and deep analysis, making the safety system both fast and intelligent.

G. Development Approach

The app is being developed using a modular approach, so each feature can be tested independently before integration. Regular testing is done on real devices to ensure usability, responsiveness, and data security. We are collecting feedback from test users to refine both functionality and interface design.

VI. Algorithm

The proposed insider threat detection methodology is implemented using the following algorithm:

1: **Initialize System:** Do the Login/ Signup Page by using Email id and password.

2: **Monitor User Routine:**Input: User's planned schedule (time, location)
Output: Real-time monitoring of user's schedule and location Track user's location at regular intervals using GPS. Check user's routine: Compare current time/location with the user's planned schedule. If user is off-schedule or deviates from the planned path, proceed to step 3. Else, continue monitoring.

3: **Detect Deviations and Send Alerts:**Input: User's real-time location, emergency contacts
Output: Alert sent to contacts and authorities Deviation detected: User is late, deviates from planned path, or enters a potentially unsafe area.
Send alert: Automatically notify emergency contacts with the user's current GPS location and a warning message.
Record and store event for later review by authorities or users.

4: **Voice Command Activation (Emergency):**Input: Voice command trigger (e.g., ”Help”, ”Emergency”)

Output: Emergency response activated Listen for voice command: Continuously listen for predefined phrases using voice recognition technology. If voice command ”Help” or ”Emergency” is detected:
Send emergency alert: Immediately share the user’s location with emergency contacts and authorities.
Activate audio message: Inform authorities of the distress situation.

5: **Hardware Integration (Wearable Device):**Input: Location data from wearable device
Output: Continuous location tracking and backup if phone is unreachable Monitor wearable device’s location: Track and synchronize location data from the wearable device (AirTag-like).
Cross-check location with app GPS tracking. If phone loses signal or is unreachable, rely on wearable device data for tracking.
Notify contacts with location data from wearable if the phone app is unavailable.

6: **Consultation Tab:**Input: User request for advice or consultation
Output: Request sent to authorities or safety advisors User selects Consultation tab in the app. Display available authorities or safety advisors for consultation.
User sends inquiry: App allows users to ask for help or report concerns to the relevant authority.
Receive response: Authorities respond, and app sends an alert if needed.

7: **AI Analysis and Alert Prediction:**Input: Historical data on user behavior, real-time activity
Output: Predictive alerts
Analyze user behavior using AI: Track movement patterns, activity, and routine. Detect anomalies: AI identifies sudden deviations or unusual patterns (e.g., long stops, unexpected locations).
Send predictive alert: Alert emergency contacts about potential threats before the situation escalates.

8: **End Algorithm**

VII. Flowchart

The AI-Based Safety App is designed to enhance personal security, especially for women, by integrating real-time monitoring, emergency response, and professional consultancy services. The flowchart illustrates the overall structure of the application, which can be broadly categorized into five major modules: **User Interaction**, **Routine Tracking**, **Emergency Handling**, **Consultancy**, and **Hardware Integration**. Below is a detailed breakdown of each module:

A. *User Interaction*

The process begins when the *app is opened* by the user, which leads to the *User Dashboard*. This dashboard serves as the central interface from which users can access all core functionalities, including routine tracking, emergency features, consultancy services, and hardware integration.

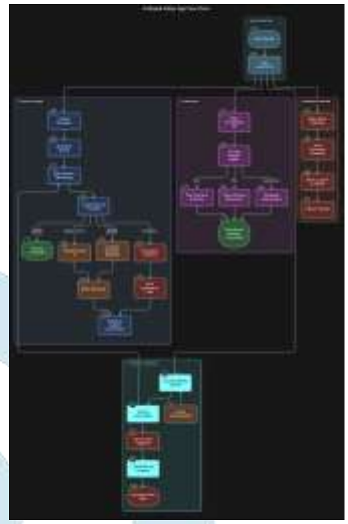

Fig. 2. Flowchart

B. *Routine Tracking*

This module is designed to monitor the user’s daily activities and ensure their safety.

- **Create Schedule**: The user inputs their routine or day plan into the app.
- **Schedule Saved**: The app confirms that the routine has been recorded successfully.
- **Start Routine Monitoring**: The system begins tracking the user’s movement and activity based on the provided schedule.
- **Check Routine Progress**: Continuous checks ensure the user follows the planned schedule. Four potential outcomes are evaluated:
  – *Routine Completed*: If everything goes as planned.
  – *Missed Check-In*: If the user fails to mark their presence at a scheduled time. In this case, **Relatives are Notified**.
  – *Location Deviation Detected*: If the user deviates from the planned route.
  – *Emergency Detected*: Triggered by unusual patterns or user distress signals. In both deviation and emergency scenarios, the app **Sends an Emergency Alert**.
- **Schedule Update Confirmation**: Post-emergency or deviation, the system updates or reschedules the routine accordingly.

C. *Emergency Handling*

This module ensures fast response in dangerous situations using voice-based AI detection.

- **Wake Word Detected**: The user triggers the emergency protocol by speaking a predefined phrase.
- **Voice Command Detected**: The app recognizes the emergency command.

- **Send Location to Officer**: The user's live location is automatically sent to nearby police or emergency responders.
- **Officer Notified**: Authorities receive the alert and act accordingly.

D. Consultancy

The Consultancy Tab provides professional support through three main channels:

- **Open Consultancy Tab**: User enters the section for assistance.
- **Choose Support Option**:
  - *Text Chat with Authority*: Enables real-time conversation with officials.
  - *View FAQ and Resources*: Users can explore educational or preventive safety material.
  - *Schedule Appointment*: Books a session with professionals like doctors, psychologists, or legal authorities.
- After completion of any of the above, the status is marked as **Consultancy Session Completed**.

E. Hardware Integration

This module connects a wearable safety device (like a smart tag or safety band) to the app.

- **Connect Safety Device**: The user pairs the hardware with the mobile application.
- **Device Connected**: Connection is confirmed and active. If *Device Disconnected*, the system records the error.
- **Device Alert Triggered**: If the wearable senses a fall, force, or manual alert is triggered.
- **Send Device Location**: The app receives and forwards the device's location.
- **Hardware Alert Sent**: Final emergency alert is dispatched to concerned parties (relatives or authorities).

VIII. Results and Evaluation

As the project is currently in progress, we have been able to test and evaluate only the features developed so far. These early evaluations help us ensure the direction of development is aligned with the goals of the app and user needs.

A. Live Location Tracking

The live location tracking module was tested on multiple Android devices under varying internet conditions. The results showed that:

- Location updates were consistent and reflected changes in real-time with minimal lag (approximately 2-5 seconds delay).
- Battery consumption was moderate and acceptable for continuous usage over a few hours.
- Location sharing with predefined emergency contacts worked reliably via Firebase.

B. User Interface Feedback

An early version of the UI was shown to a small group of users (students and faculty members). Their feedback highlighted that:

- The navigation between screens was intuitive and clear.
- Emergency buttons were easily accessible and distinguishable.
- Color choices and fonts were readable, even in outdoor light.

C. Emergency Notification System

Preliminary tests of the emergency notification feature were conducted using simulated scenarios. We found that:

- The system could successfully send alert messages to linked contacts within 3–6 seconds.
- In most test runs, alerts were delivered even when the app was running in the background.
- Some inconsistencies were observed when the device had low connectivity or when notifications were sent during idle states of the phone, which we are currently optimizing.

D. Experimental Validation

To make sure our core safety features actually work as intended, we're testing them against specific performance metrics as part of our validation process.

- **Time-to-Alert:** We're tracking how quickly the system reacts—from the moment it detects a voice command or an unexpected change in routine to when it sends out an alert. So far, early tests show it typically takes between 3 to 6 seconds to respond.
- **Voice Command Accuracy:** We're testing the wake word detection model with over 500 different sample phrases. So far, it's recognizing the wake word correctly about 89
- **False Positive Rate:** We're keeping a close eye on accidental emergency alerts during normal activities to make sure the system stays reliable. Right now, fewer than 5
- **Battery Usage:** We tested continuous tracking with checks every six hours, and even on mid-range Android phones, battery usage stayed reasonable—only about 10-15

E. Security and Privacy Considerations

Given the sensitive nature of user location and emergency data, data protection is a top priority:

- **Encryption:** All data transmission, including live location and emergency alerts, uses end-to-end AES-256 encryption over secure HTTPS channels.
- **User Authentication:** Firebase Authentication is used to enforce secure login through email / password and future integration of OTP-based two-factor authentication (2FA).
- **Access Control:** Emergency contacts are validated by the user and stored securely. Only designated recipients can access location data.

- **Data Retention Policy:** Your sensitive data automatically clears after 72 hours—unless you choose to save it for reporting. You're also always in control: if you want to delete logs sooner, you can do it anytime in settings
- **Regulatory Compliance:** The app design considers principles from GDPR and India's upcoming Digital Personal Data Protection Act (DPDP) to ensure user rights over their data.

F. Limitations and Current Challenges

Since voice command activation and AI-based scheduling are still in development, they could not be tested. In addition, security enhancements and hardware integration have not yet been evaluated. We are also refining the back-end logic to minimize false triggers and ensure robustness.

G. Ongoing Improvements

We continue to iterate based on the initial testing results. Performance optimization, notification reliability under low signal conditions, and background service improvements are currently being prioritized.

IX. Conclusion

The development of an AI-Based Safety App represents a trustable approach to improve personal safety through introducing of advanced technologies such as AI, machine learning, and real-time data processing. By Imposing techniques like threat detection, and live location-based safety measures, the app can proactively respond to potential dangers, ensuring that users are alerted even before they manually initiate help.

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