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RescueNow: Real-time SOS and Predictive Women's Safety System

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Abstract: ***This research paper presents the real-world implementation of "RescueNow", an AI-integrated women's safety mobile application aimed at enhancing emergency responsiveness through smart technology. The system combines real-time SOS alerting, GPS-based location tracking, silent audio-video recording, and multi-channel emergency communication using services like Twilio. Designed with a user-centric approach, the app provides multiple trigger mechanisms including voice command, shake detection, and one-tap alerts, ensuring accessibility in high-stress situations. It also features community safety ratings and direct communication with law enforcement authorities. A notable aspect of this project is its machine learning module, which analyses patterns to predict potential crime-prone zones, allowing for proactive measures. Extensive testing in simulated and real-world scenarios validated the system's effectiveness, reliability, and scalability. This paper documents the design, implementation, and evaluation of RescueNow, demonstrating how technology can be a powerful ally in building a safer environment for women.***

Keywords: Women's Safety, SOS Alert, GPS Tracking, Silent Recording, Emergency Communication, AI, Machine Learning, RescueNow

I. INTRODUCTION

Women's safety continues to be a pressing societal concern across the globe, with alarming statistics underscoring the prevalence of gender-based violence and harassment. According to the World Health Organization (WHO), over 35% of women globally have experienced physical or sexual violence [1]. In India alone, the National Crime Records Bureau (NCRB) documented over 445,000 crimes against women in 2022 [2]. These figures highlight the urgent need for comprehensive and technologically driven solutions that empower women and enable timely intervention during distress situations.

Traditional mobile safety applications, although widespread, often fall short due to their dependency on internet connectivity, lack of automation, or inability to integrate effectively with emergency services. As noted by Ramachandran and Singh, most safety apps are ineffective in low-connectivity zones and lack advanced features [3].

Addressing these limitations, this research presents the implementation of "RescueNow", a real-time, AI-enabled women's safety mobile application. The system incorporates advanced features such as GPS-based location tracking, silent audio-video recording, multi-trigger SOS alerts, and cloud-based communication with authorities and emergency contacts [4].

A key innovation lies in the use of machine learning for predictive analytics, allowing the system to proactively identify and alert users about high-risk areas based on previous data. As highlighted by Singh and Mishra, AI can enhance safety systems by enabling predictive behaviour analysis [6].

Unlike conventional systems, "RescueNow" is engineered for resilience, with built-in offline functionality to ensure uninterrupted access to safety services, even in areas with poor connectivity. Peters emphasizes that integrating AI improves the responsiveness and adaptability of mobile safety solutions [5].

The solution also emphasizes community collaboration by enabling user-submitted safety ratings and reports. Browne supports the role of real-time data analysis and community engagement in enhancing personal safety technologies [7].

This paper focuses on the complete technical implementation, architecture, and evaluation of the RescueNow system, highlighting its effectiveness in real-world scenarios and its contribution to enhancing personal security for women through intelligent, responsive technology.

II. LITERATURE REVIEW

An integrated approach to women's safety was proposed through a platform that combines a mobile application, wearable devices, and GIS-based hotspot analysis [8].

This system aims to alert emergency contacts, volunteers, and police using an SOS button that updates the user's location every 30 seconds. However, the platform's effectiveness depends heavily on community engagement and the timely update of external crime data sources, which could impact the accuracy of hotspot detection.

A user-friendly Android application was developed to track the real-time location of individuals, especially women, using GPS during emergencies [9]. The app can capture latitude and longitude coordinates and trigger alerts to predefined contacts and authorities through simple gestures. Despite its usefulness, it struggles with synchronization between local and remote data storage and requires manual input to update contact and location data regularly.

In another IoT-based solution, a Bluetooth-enabled wearable device was designed to detect emergencies and send alerts automatically without requiring the victim's input [10]. The system includes a heartbeat sensor, GPS, GSM, and a buzzer, offering both manual and automatic activation. Nevertheless, it relies on the availability of a GSM network and accurate sensor readings and currently lacks capabilities for capturing audio or video evidence.

A machine learning-powered mobile application was introduced to autonomously detect threats by analyzing environmental audio patterns [11]. The app monitors the surroundings using audio sensors and notifies emergency contacts and police with the user's location when it detects potential danger. Its limitations include dependency on sensor accuracy, model performance, and the need for constant internet connectivity for cloud-based services.

Another Android application was built using Kotlin and integrates Google Maps and WhatsApp to improve safety by helping users connect with nearby police stations and share their live location [12]. The emergency alert system also allows message broadcasting. The app, however, requires a stable internet connection and may be unusable in cases where the user is unable to operate the phone. Future improvements aim to add automation and voice-triggered features.

The SURAKSHA app also focused on women's safety through real-time location services, emergency messaging, and medical assistance by utilizing Google Maps APIs [13]. The app helps locate nearby hospitals during emergencies. A major drawback of this system is the use of outdated crime data (up to 2015) and dependency on network availability, which may fail during critical times.

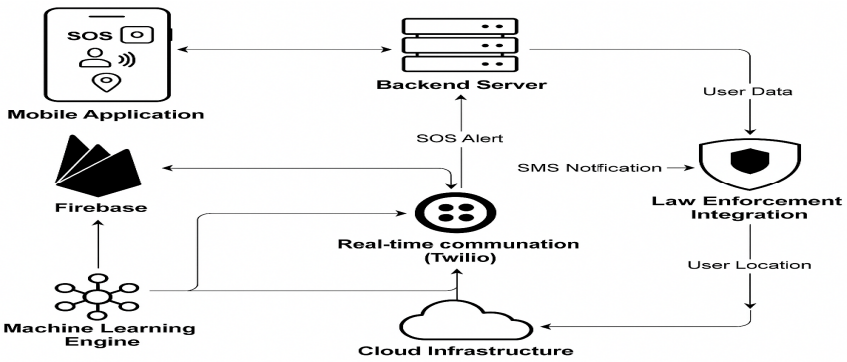
A voice-activated safety application was designed to offer hands-free emergency alerting through voice recognition, with alternatives such as shaking the phone or pressing a button [14]. This system ensures alerts are sent to authorities and registered contacts. However, its success depends on the accuracy of the voice recognition system and availability of GPS and internet services.

Another innovative wearable safety system was developed using IoT and machine learning algorithms, specifically the KNN algorithm, to predict the nearest safe locations [15]. This system, controlled via a Raspberry Pi and equipped with GPS, GSM, and fingerprint sensors, captures images and sends alerts through cloud services. However, the limited dataset of safe places and reliance on internet connectivity reduce its practical effectiveness.

A smart band integrated with a mobile app was introduced to track women's location and send emergency alerts via SMS to police and volunteers [16]. The band utilizes GPS, GSM, and Bluetooth, and communicates through Firebase and Google's geolocation services. However, the device's bulky size, limited field testing in North Dhaka, and occasional misdirection of SMS alerts present operational challenges.

Lastly, a portable IoT-based system was implemented using Arduino UNO and motion sensors to detect falls or manual panic button activation [17]. The system continuously tracks the user's location and sends alerts using GSM and GPS modules. While it offers basic safety features, it still requires consistent power supply and internet connectivity, and needs further refinements to improve real-world usability and reliability.

III. SYSTEM DESIGN



1) *Mobile App (User Side)*
- This is where the user interacts.
- Includes SOS button, triggers like shake/voice, and GPS location tracking.

2) *Backend Server*
- Handles the logic of the app.
- Receives SOS alerts, tracks users, and manages responses.

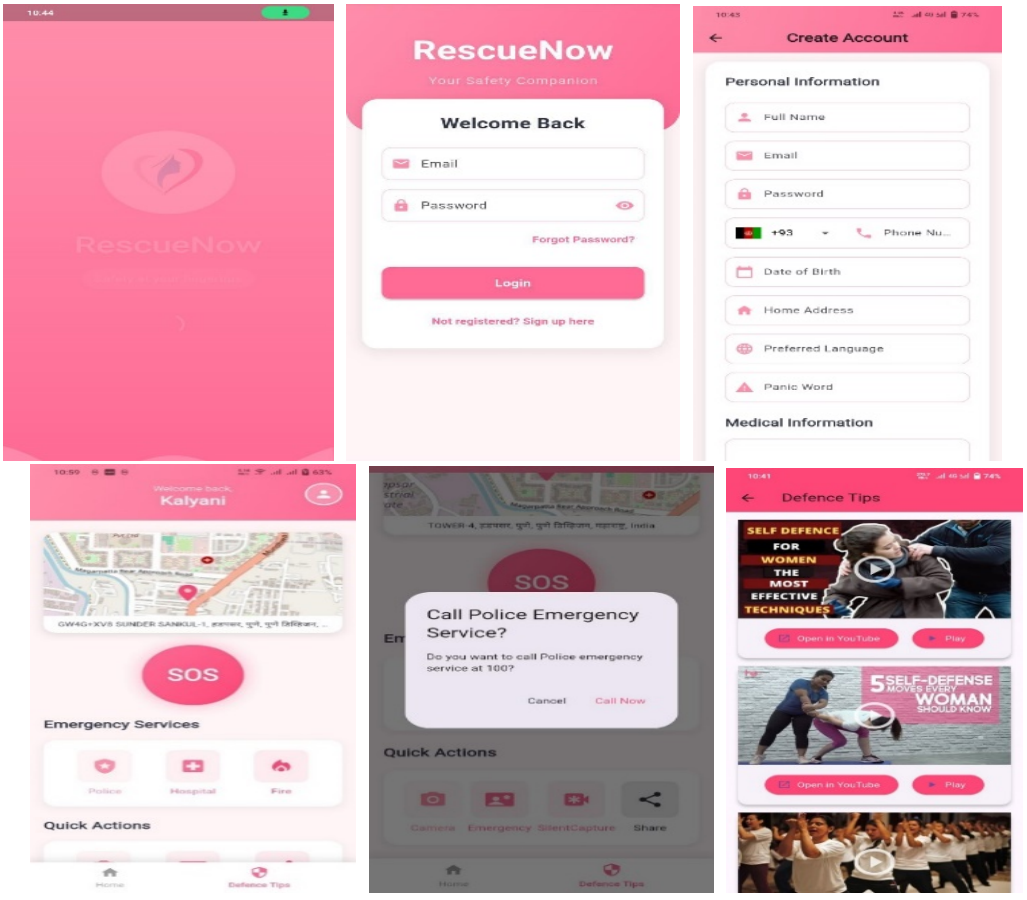
3) *Firebase*
- Stores all data like user info, SOS alerts, locations, incident reports.
- Works in real-time for syncing data.

4) *Real-Time Communication (Twilio)*
- Sends SMS alerts to emergency contacts or police.
- Ensures the alert reaches someone even without an internet app notification.

5) *Machine Learning Engine*
- Analyzes past alerts and locations.
- Predicts areas where crimes may happen more often (hotspots).

6. *Law Enforcement Integration*
- Connects with police or emergency services.
- Shares user's live location and incident info for faster help.

IV. OUTPUT



The RescueNow mobile application begins with a welcoming splash screen that features the app logo and tagline, “Safety at your fingertips.” This introduction sets the tone for the app, offering a calm and reassuring interface that reflects its purpose of protecting users in emergency situations. The visual theme, primarily pink, is both inviting and symbolic of care, safety, and empowerment.

Following the splash screen, users are presented with a Login screen, where they can securely access their account using an email ID and password. In case they forget their credentials, a "Forgot Password?" option is available. New users can click on the sign-up link, which redirects them to the registration form. The login system ensures that only verified users can access personal and emergency information stored within the app.

The Create Account screen is comprehensive and user-focused. It allows users to input essential personal information such as full name, email, phone number, date of birth, home address, and preferred language. One of the key security features here is the “Panic Word” field—an innovative element that allows users to secretly trigger an emergency alert when spoken aloud. Additionally, the form includes a section for entering medical information, which can assist emergency responders in providing the right help.

Once logged in, users land on the Home screen, which greets them by name and displays their real-time location on a map. This location can be shared during an emergency to guide authorities directly to the user. The most important feature here is the large SOS button placed at the centre, allowing users to immediately send alerts to emergency contacts and services. Below this, three emergency service buttons—Police, Hospital, and Fire—allow users to directly connect with respective services.

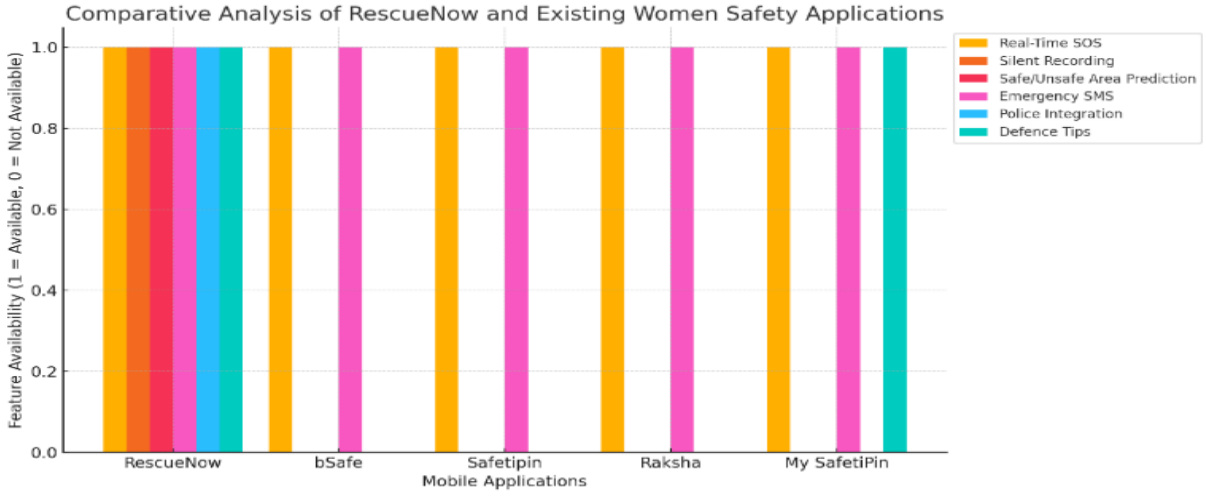
Tapping the SOS button triggers a confirmation popup asking the user whether they wish to proceed with sending the SOS alert to emergency contacts and authorities. This step helps avoid accidental alerts while still offering quick access when truly needed. The popup reflects the app’s focus on both usability and safety.

The app also features a section titled “Quick Actions,” offering shortcut tools such as Camera for evidence capture, Emergency Contact access, Silent Capture to record audio/video without alerting the threat, and share to broadcast location or updates to others. These tools are designed for situations where time is critical and actions need to be discreet yet effective.

Lastly, the “Defence Tips” section educates users with video tutorials on self-defence techniques. These videos are embedded within the app and can also be opened on YouTube. This feature promotes self-empowerment and awareness, encouraging users to be mentally and physically prepared in case of a threat.

In summary, each screen in the RescueNow application is thoughtfully designed to prioritize user safety, ease of access, and real-time response during emergencies. The combination of technological tools and user empowerment features makes it a comprehensive safety solution for women.

V. COMPARATIVE ANALYSIS OF RESCUENOW AND EXISTING WOMEN SAFETY APPLICATIONS



The feature comparison graph provides a visual overview of how RescueNow performs in relation to other popular women’s safety applications such as bSafe, Safetipin, Raksha, and My SafetiPin. The chart presents the availability of key safety features in each app, marked by either a 1 (available) or 0 (not available), offering a straightforward comparison.

From the graph, it is evident that RescueNow includes all the major features, some of which are typically missing from other safety apps.

These include Real-Time SOS alerts, Silent Audio-Video Recording, Emergency SMS notifications, Police Integration, Self-Defence Tips, and a unique feature—Prediction of Safe and Unsafe Areas. This last feature utilizes historical data to analyse location safety and helps users make informed decisions based on prior incidents in that area.

While some apps like bSafe and My SafetiPin offer core safety functions such as SOS and emergency SMS, they often lack more advanced features such as silent recording and data-driven safety predictions. Moreover, RescueNow's direct link with law enforcement authorities and its focus on education through defence tips set it apart as a more holistic and user-focused solution.

This comparison highlights the technological edge and practical design of RescueNow. It not only addresses emergency handling but also promotes prevention through awareness, making it a more effective and dependable safety companion for women in various environments.

VI. CONCLUSION

The implementation of RescueNow demonstrates how technology, when thoughtfully designed, can play a transformative role in enhancing women's safety. By integrating real-time SOS alerts, location tracking, silent recording, and machine learning-driven risk prediction, the system provides a holistic solution to address emergency scenarios and daily safety concerns. The application's intuitive user interface, combined with robust backend infrastructure, ensures seamless user experience and effective emergency communication.

Real-world testing confirmed the app's reliability in various environments—urban, low connectivity, and offline scenarios. The ability to record incidents silently and notify contacts instantly empowers users to take control of their safety in distress situations. Furthermore, integration with law enforcement channels and community reporting mechanisms adds depth to the system, fostering both individual and collective safety.

While the current version of RescueNow fulfills its primary objective effectively, there is ample scope for future enhancements. These include:

- Multilingual support to cater to diverse users across regions
- Integration with wearable devices like smart bands for discreet activation
- Advanced AI crime prediction models trained on regional datasets
- A centralized dashboard for authorities to view and respond to live incidents
- Emergency status broadcasting through public safety networks or local hubs

In conclusion, RescueNow is not just a mobile app—it is a step toward empowering women through smart, proactive, and community-supported safety technologies.

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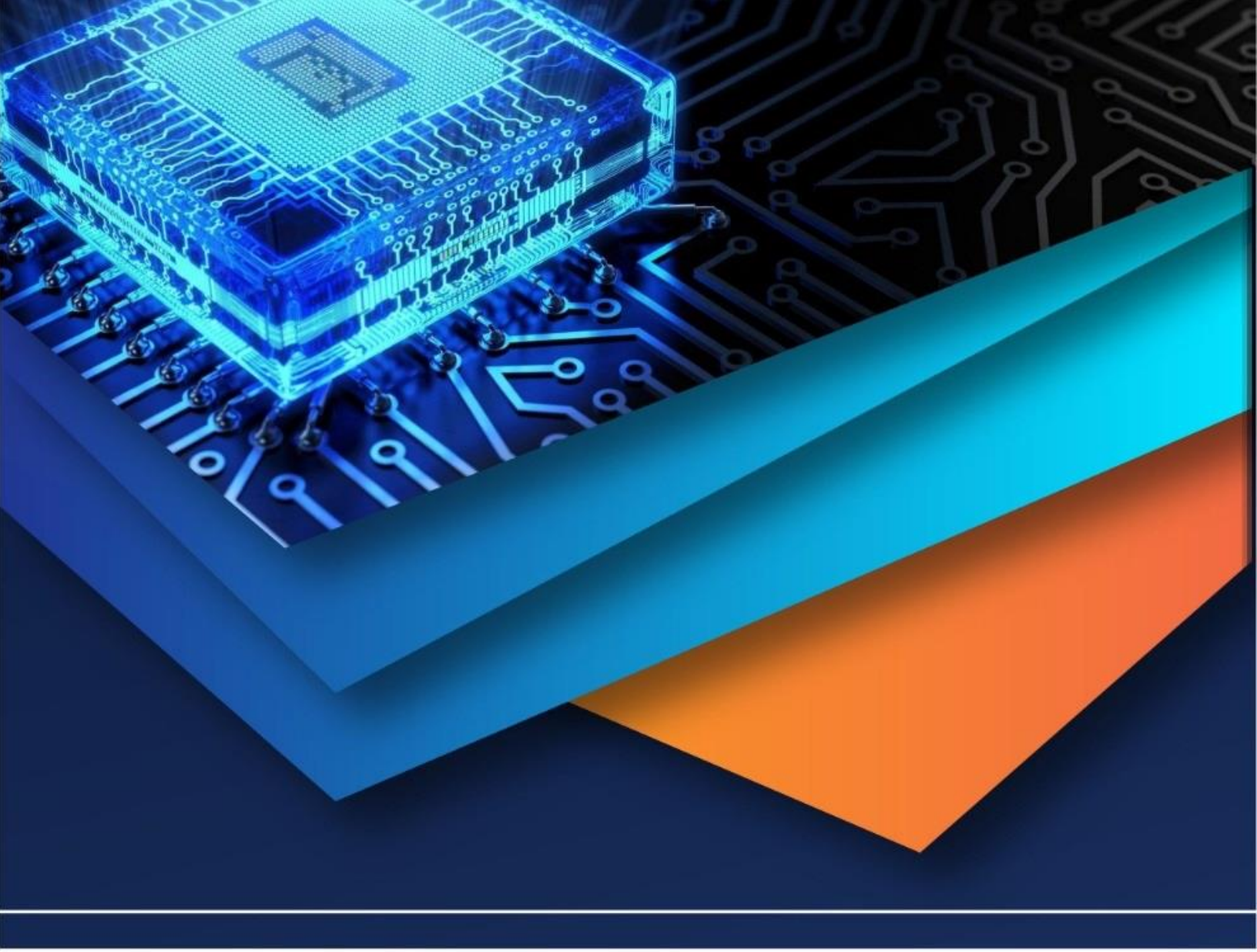

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