

# A Survey for Women Safety Alert System with Location-Based Notification and Community Awareness

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**Abstract:** Individual's safety and well-being in public settings, particularly for women, have emerged as major concerns in modern society. Enhancing public safety by analysing women's screams and focusing on the detection of suspicious activities and timely intimating it to the nearby police station and preferred contacts. Proposing a comprehensive system that integrates advanced audio processing techniques, machine learning algorithms, real-time communication mechanisms, combination of geospatial technology, mobile applications and sensors connected to wearable devices provides security alerts. This comprehensive approach aims to create a safer environment and empower women to take control of their safety. It's a wonder technology and community involvement for a greater impact. By using advanced audio processing and machine learning techniques, the system can identify specific patterns or characteristics in screams that may indicate a potential threat. This innovative approach aims to enhance public safety and provide early warning signs in emergency situations. It's an interesting application of technology that could help improve response times and prevent incidents.

**Keywords:** Audio processing, Security Alerts, Machine learning Algorithms, Geospatial technology, Sensors, Wearable device

## I. INTRODUCTION

The women safety alert system analyses the women screams, focuses on the suspicious activities by detecting and intimates it to the nearby police station and preferred contacts.

The first part of the system focuses on developing an intelligent scream recognition system. By using advanced audio signal processing techniques, the system extracts important features from women's screams, like pitch, intensity, and spectral characteristics. These features are then analysed by a machine learning model trained on a diverse dataset of scream samples. This allows the system to accurately classify screams as either normal or indicating distress. It's an impressive combination of technology and data to ensure accurate detection and response in emergency situations.

The second part focuses on integrating the scream recognition system into public spaces, using existing surveillance infrastructure. By constantly monitoring audio streams, the system can detect suspicious screams and initiate a series of actions. This includes identifying the location, activating nearby cameras for visual confirmation, and analysing the surrounding environment in real-time. Additionally, the system includes a mobile application for women to carry on their smartphones. The app tracks the user's location through GPS and allows them to trigger an alert in case of a perceived threat or distress.

The location-based notification system is a crucial part of our system. It allows us to communicate with local law enforcement and emergency services, sharing real-time information about the user's location and the nature of the perceived threat. This enables a swift and targeted response to incidents, optimizing the efficiency of emergency services. And to ensure a timely response to potential threats, by the intelligent alert and notification system in place. Once a distress situation is confirmed, it automatically notifies law enforcement agencies, nearby individuals, and relevant emergency services. Leverage modern communication technologies like mobile applications and centralized

monitoring systems to ensure a swift and coordinated response. It's all about using the power of technology to keep everyone safe and secure.

## II. LITERATURE SURVEY

In [1], the author developed a women safety system as the number of crimes are increasing against women. The GPS based women's safety system operable through fingerprint, if any trouble occurs by just placing her finger on the scanner, system sends the location to authorized personnel and number saved previously in the system through SMS message.

In et.al [2], the author proposed a model for connecting the user's map with Google map, user can use all the features of the Google Map. Moreover, it is connected to the WhatsApp in which user can share live location along with emergency message, at the same time it also shares the same in WhatsApp status as the remaining people can know the user's situation and take necessary action on it.

In [3] the author developed a women safety assistant device with biometric verification. The system is divided into two parts the hardware and software, hardware consists of main device and software consists of android application. The device includes a fingerprint sensor that is used to recognize the user and is capable of storing 1000 fingerprints. It provides the sense of security and protection to the user by GPS tracking and advanced technologies.

In [4], the authors introduced an innovative "Safety Device using IOT" centered around Arduino Nano, NEO6M GPS module, GSM technology, SOS button, RF transmitter and RF receiver. The portable device aims for individual's empowerment especially for women and children during solo travelling or commutes. When SOS button is pressed it gets activated, the device initiates a sequence of actions to ensure the user's safety.

In et al. [5] the authors explored using the computer vision and machine learning for automatically analysing the abnormal behaviours in CCTV images. The LRCN model gives 86% of accuracy for identifying actions like fighting and running.

In [6], the authors proposed a model by using the deep learning and machine learning for detecting the human activities in CCTV footages and identify the suspicious behaviours. Analyses the data after recognizing the activities, enabling them for real-time detection.

In [7], the authors by using LRCNN, ConvLSTM, Confusion Matrix and Gated Recurrent Unit algorithms. Among these algorithms CNN provides highest accuracy. The 6 suspicious activities like snatching, running, punching, kicking, shooting and falling are identified and detected in the public places.

In [8], the author's proposed system is an application, involves the introduction for IBEACON technology. The system uses the BLE (Bluetooth Low Energy) communication technology in which it determines the location of the user. System provides the information such as location, distance of the affected person from the preferred contact person is uploaded in a webpage. The MEMS is used for detecting a sudden drop of that particular person.

In [9], author proposed a model which helps to reduce crimes and detect the crimes in many ways i.e., by arresting the criminals to reduce the crimes by carrying out various measures. The Android system is developed to control crimes in our society, using the KNN algorithm to find the nearest location so that the necessary action can be taken for the user and police station. The main objective the system is to provide security and take proper precautions.

In [10], the authors developed an android application for ensuring women safety with Safe Guard women, the ultimate android app. The app is designed to empower and protect women in every aspect of their lives. The app provides the immediate assistance, real-time location sharing, in-app chat or call support, safety tips and information and community engagement. The Safe Guard Women app provides the personal security.

In [11], authors integrate the machine learning and computer vision for crime prevention and detection. By combining these technologies significantly, it enhances law enforcement's ability to predict, prevent and solve crimes. KNN provides best accuracy.

In [12], the authors designed an application for campus safety in college community. Walk Safe app notifies to the user if any emergencies or incidents taking place around them based on that update. The past incidents are reported to the University Police database. Wearable devices like smart watches are taken into consideration when designing functions.

In [13], the authors designed a system to create technical solution that serves both the user and admin. The Location based tracking system is a real-life problem-solving application.

In [14], the authors proposed a system to provide the security to women. The design of the system makes use of sensors, Bluetooth communication, SMS and MMS, GPS and mobile database system. A machine learning approach based on supervised classification algorithm is used to determine if the women is in danger and the system is implemented in android.

In [15], the authors developed a system that sends alerts, is portable and uses numeric location codes. This system meets ISO standards, recommendations include IP cameras using high detection testing, machine learning, image processing, noise reduction, tracking and detecting algorithms by this it analyses the threshold and provides accurate decision.

In [16], the authors developed a system that recognizes the face, by intimating the authorities and identifies the movement happening in the volatile areas and later it activates an alarm. KNN algorithm provides best accuracy of 98.45%.

In [17], the authors designed an android application to enhance the user's safety by providing real-time information about location. When the user feels unsafe, can share their location with the preferred contacts and authorities. This app includes features like crime reporting, geo-fencing and emergency auto-dialing to enhance security awareness.

In [18], the authors developed a system to detect suspicious human activities in images, videos and CCTV. The suspicious activities like robbery, fire and violence can be prevented by this system.

In [19], the authors proposed a system by integrating the RFID and GSM technology to provide advanced and proactive solution for the security of women. The RFID technology gives precise real-time tracking and GSM technology enables communication over mobile networks.

The authors in [20] stated, for detecting crime and related events used the artificial intelligence and digital image processing in surveillance systems. By monitoring the visual and audio data from the surveillance cameras with the microphones, process them to identify the potential threats and notify if to the authorities or officials.

In [21], the authors designed a system ensuring women safety in the smart cities is a need for day-to-day life. As the crimes are increasing in the society, for the safety of the women the application has been developed and wearable devices are introduced. With the help of the wearable devices if any violence or crime happening to women, it analyses and sends information with location to the emergency responders.

In [22], the authors developed the technique for the welfare of girls and women. It helps the women at risk or when they travelling outside regardless of time. As the crimes are increasing in society, the android application is developed to prevent the suspicious activities or natural disasters, and later alerts the authorities with the android mobile phone. By this it prevents the illegal activities happening.

The authors in [23], developed the system for women, young girls, ladies and mother's as they are struggling to be safe and protected from insensitive men, in streets, public places and in public transport the dominion of the hunters. The wearable devices are created to prevent if any kind of harm or crime occurs for them the button is pressed by the system and gets activated and the victim captures the picture of the attacker, and sends the location to the predefined emergency contact numbers or to police via the mobile phone.

The authors in [24], the surveillance system used to help the human at night mounted with light, sound sensors and alert sensors, GPU. The video is taken as input it is pre-processed and detected using motion detection algorithm and extracted using feature extraction and if any abnormal activities found it is alerted using alert system. ML is associated with IOT and cloud computing helps to collect data from the person in danger and tries to save them.

The authors in [25],proposes the improving standard police video surveillance by using advanced techniques like Histogram of Oriented Gradients (HOG) and Support Vector Machine (SVM). The system aims to classify frames into normal or violent activities, triggering alarms for the latter. It includes motion detection, tracking individuals, and alerting observers to prolonged suspicious behaviours. The goal is real-time data acquisition for enhanced situational awareness and security. The system plans to reduce false alarms by refining SVM training and upgrading to handle input from multiple cameras for more accurate predictions. Optimization of feature vectors is also considered for efficient operation.

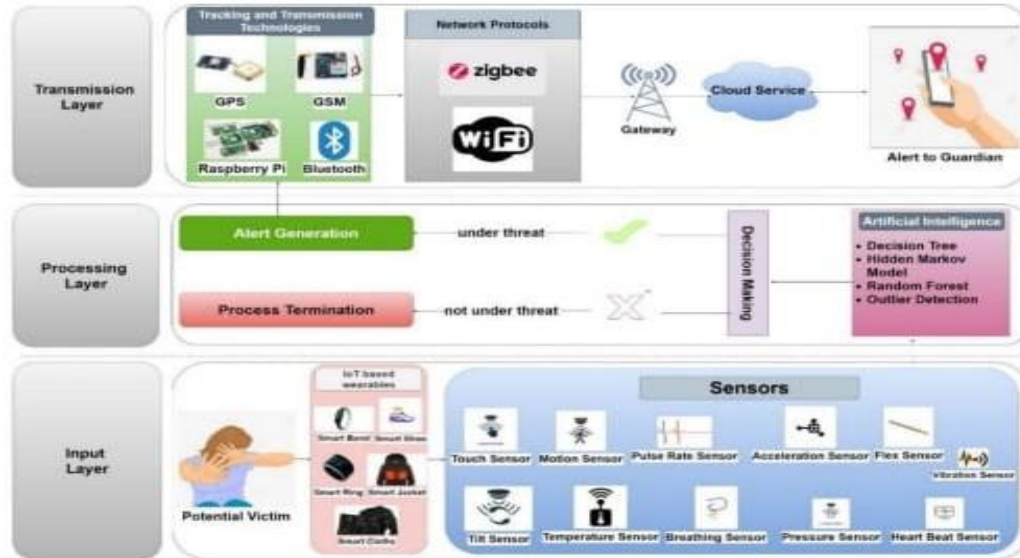


Fig. 1 Architecture for IOT based women's safety device

In Fig. 1, [1] the transmission layer includes GPS, GSM, Zigbee and Wi-Fi, which are used for communication and data transfer. The processing layer involves decision making processes, artificial intelligence and machine learning models like Decision tree and Hidden Markov model. The input layer consists of sensors that collect data and alert generation and termination processes are part of system's functionality. The potential victim and guardian alert system seems to be significant focus and the use of Raspberry Pi and Cloud Service is fascinating for the architectures

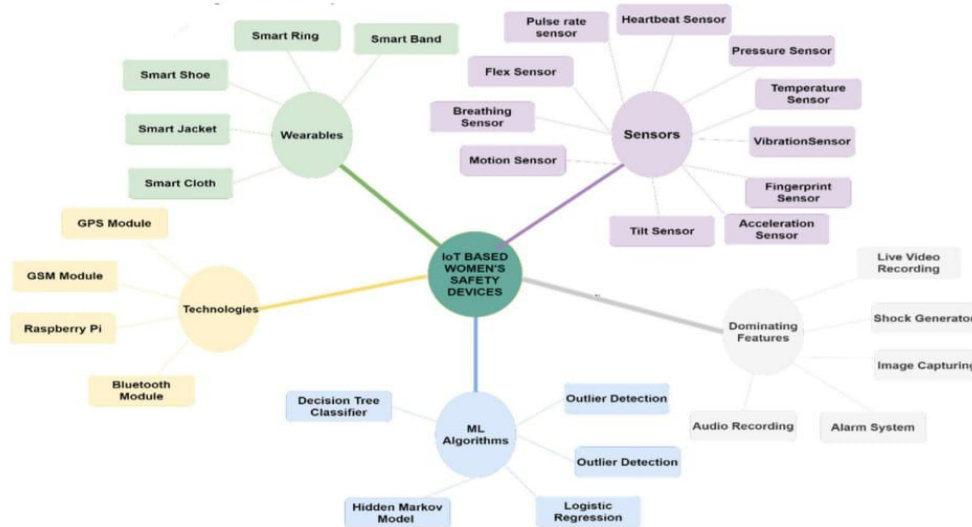


Fig. 2 Data flow diagram

In Fig. 2, [1] GSM is the technology that allows the users phone to work on a cellular network, to make calls and sending messages. It keeps the user connected wirelessly. Bluetooth modules are devices, which help our gadgets communicate to each other wirelessly over distances. Fingerprint sensors are the scanners that read a person's unique fingerprints, which can be incredibly valuable for ensuring safety and security, especially for women. These technologies and features are truly groundbreaking. Machine learning algorithms contribute to women's safety devices by enabling them to analyse and respond to various situations, making them more proactive and effective. Live photo

capturing provides real-time insights, while outlier detection can help identify potential safety threats. These advancements are being used to create safer environments for women.

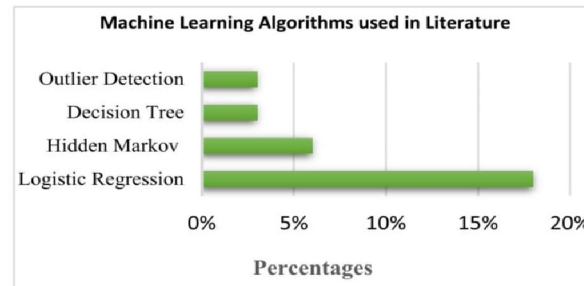


Fig. 3 Machine Learning Algorithms used in Literature

In Fig. 3, [1] Machine learning algorithms are like super-smart tools that helps to make sense of tons of data. Outlier Detection helps identify unusual instances like fraud detection or network security. Decision trees make decisions based on the features, it is great for tasks like classification of data. Hidden Markov model represents the systems with hidden states, it is useful for things like speech recognition. Logistic Regression is all about predicting the outcomes with two possible values, like whether the scream analyzed by the system is dangerous or not, based on that decision it provides the output.

### III. CONCLUSION

Our suggested system provides a comprehensive solution to improve public safety, particularly for women, by utilizing advanced scream analysis algorithms to detect suspicious activities. The combination of real-time communication and intelligent alert mechanisms provides a quick response, perhaps advertent or mitigating harm. Implementing this approach could improve public safety and serve as a crucial tool for law enforcement and urban planners.

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