An Automated Women Safety Framework Using Machine Learning and Real-Time Risk Assessment

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***Abstract*—The safety of women remains a critical issue, particularly in urban and semi-urban environments where threats may occur unexpectedly. Most existing safety applications depend mainly on manual alerts such as panic buttons, calls, or SMS, which may not be possible during emergencies. To overcome this limitation, this research proposes an advanced women safety framework using machine learning for early threat detection and rapid response. The system continuously analyzes real-time GPS location, movement patterns, time-based risk zones, and user behavioral activities. It also incorporates historical incident data to identify unsafe areas and generate an accurate risk score. Based on the extracted features, the model classifies situations as safe or unsafe using supervised machine learning techniques. When the system detects a potential threat, it automatically triggers alerts without requiring manual input. Emergency notifications containing live location and risk information are sent to trusted contacts and local authorities. This automation reduces response time and increases the chance of immediate support. Experimental evaluation shows that the proposed model provides improved accuracy and reliability compared to traditional manual systems. The framework also reduces false alarms by using intelligent classification and risk-based decision making. It can be integrated into mobile safety apps, wearable IoT devices, and smart city platforms. The solution is scalable, efficient, and suitable for real-time implementation. Overall, the proposed system enhances women safety by enabling proactive monitoring and automated emergency response.**

***Index Terms*—Women's Safety, Machine Learning, Threat Detection, Emergency Alert System, Predictive Analytics**

I. INTRODUCTION

Safety concerns related to women continue to pose significant challenges in modern society, particularly in densely populated urban and semi-urban areas. Rapid urbanization, increased mobility, and evolving social dynamics have contributed to situations where women may encounter threats without prior warning. Incidents such as harassment, stalking, and physical assault often occur unexpectedly, leaving limited opportunities for victims to seek immediate assistance. Although awareness initiatives and safety measures have increased, ensuring timely and reliable protection remains a complex challenge.

The widespread use of mobile devices has led to the development of various technology-driven safety solutions for women. Most existing applications rely on user-initiated actions, such as activating panic buttons, placing emergency calls, or sending alert messages. While these mechanisms provide basic support, their effectiveness is often limited in high-risk situations where individuals may be unable to respond due to fear, physical restriction, or time constraints.

Recent advancements in data-driven technologies have enabled the development of intelligent systems capable of identifying behavioral patterns and predicting potential risk scenarios. Machine learning techniques, in particular, are effective in processing large and diverse datasets to recognize contextual and behavioral trends. By utilizing information such as real-time location data, movement patterns, historical safety records, and situational inputs, intelligent systems can assess risk levels and detect early warning signs before an incident escalates. This study presents a proactive women's safety system that employs machine learning techniques for real-time risk assessment and situational awareness.

The system constantly observes various data sources to assess a person's safety condition. According to the evaluated risk level, scenarios are categorized as either balanced or potentially hazardous, allowing for automatic alert generation without requiring direct

user involvement. This level of automation significantly improves reaction speed and strengthens the effectiveness of the emergency assistance system. The suggested method merges ongoing risk assessment with automated notification distribution to enhance proactive safety management. By emphasizing proactive risk identification instead of reactive measures, the system enhances safety conditions and facilitates intelligent, data-informed safety strategies for women.

II. LITERATURE SURVEY

For a long time people have been trying to figure out ways to make women safer and put a stop to bad things happening to them. We have things, like phone numbers we can call in an emergency ways to tell the police about bad things that happen and cameras that watch over us to help keep women safe. These things are really important. They do make a difference but someone has to actually use them for them to do any good. The problem is, they usually only do something after something bad has already happened to women. Womens safety is still a worry for all of us. We really need to find ways to keep women safe. There are these apps for mobile and web that are supposed to help women. People have been studying how to make these apps work better for women. These apps have things like SOS alerts that women can send for help and they can also share where they are using GPS. The apps will even send messages to the people women trust in case of an emergency, like family or friends. Womens safety apps are helpful because they let Womens safety apps quickly tell people you trust that you need help.. Womens safety apps do not always know what is going on and cannot predict what will happen next. A lot of the time you have to tell Womens safety apps to send an alert, which's not easy to do when you are really scared.

Womens safety apps are not always useful when things get really bad. Womens safety apps need to get better. People are using machine learning more to look at crime and figure out what might happen in the future. They use ways to analyze what happened before like Linear Regression and Decision Trees and Support Vector Machines and Random Forests. Random Forests are really good, at this because they can deal with information that is not straightforward. Random Forests are especially good because they can handle information and that is why Random Forests tend to work well.

Machine learning is used to study crime. The problem is that it usually helps the police and not ordinary people. Machine learning is really good at looking at crime data. For example Random Forest models are very good at analyzing crime data. People are using machine learning to look at crime patterns and understand machine learning better in the context of crime studies. Machine learning is a tool, for understanding crime.

Some systems use Google Maps to find police stations or safe zones that are close by. This is really helpful when you need help in an emergency. Google Maps is a part of these systems.. Google Maps systems have some problems. They are hard to use because they are not designed well. The information on Google Maps systems is often old and not helpful. Sometimes the links, to the websites do not work on Google Maps systems. From the literature review, we see a gap between predictive crime analysis and real-time emergency assistance for women. Most systems either focus on prediction or panic response, but seldom on both. This project aims to fill this gap by combining machine learning-based crime risk estimation with real-time panic alerts, location tracking, police routing, and verified emergency resources in one easy-to-use web application.

III. PROBLEM STATEMENT & OBJECTIVES

3.1 Problem Statement

Women are still having a time staying safe. When they need help it takes long to get there. A lot of women do not know where to go for help. Women feel scared. They might not be able to call for help or say what is happening. The systems that are supposed to keep women safe are not doing a job. These systems usually only do something after something bad has already happened. Women need to talk to someone about their problems or get help. Sometimes they cannot do that when they are, in a bad situation. Women need help. They need it fast so they can stay safe. Women need safety that really works when they need it the most. The safety mechanisms we have now are just not good enough, for women. Women deserve to feel safe. The safety mechanisms should be able to protect women.

Today women safety apps mostly just send out SOS alerts. Share the users location. The women safety apps do not really help women identify situations before they happen. Some systems try to figure out if a crime will happen in the future by looking at what happened in the past.. These systems are mostly made for people who work for the government or for people who analyze data. The women safety apps are not made for regular people to use every day. This makes a difference, between looking at crime data and actually being safe every day. We are focusing on womens safety. Womens safety applications need to get better. Womens safety is what we care about.

The big problem is that safety services do not work together. When people need help in an emergency they have to look at lots of websites and apps. They have to find the phone numbers of emergency contacts and the addresses of police stations and places where they can get help. People also need to learn about safety services. How they work. Safety services are not doing a job of helping people in emergency situations and that is the main issue, with safety services.

3.2 Objectives

Some of the main goals of the SheSafe Women Safety System include:

- Reviewing past crime data to find patterns and trends related to crimes against women.
- Creating simple risk indicators (Low, Medium, High) to help users easily understand potential safety levels.
- Providing a panic alert mechanism that captures live location and sends emergency notifications right away.
- Allowing quick access to nearby police stations using location-based routing services.
- Offering verified emergency helplines and click-to-call support to cut down response time during emergencies.
- Combining prediction, alerting, routing, and emergency resources into a single platform.

IV. PROPOSED METHOLODOGY

The Women Empowerment system is designed to help women feel safer. It uses computers to detect potential dangers and provides support for women in challenging situations. The system excels at identifying risky scenarios and delivers the necessary assistance during emergencies.

The Women Empowerment system is made up of two main parts:

- Analyzing past incidents to predict future risks
- Providing immediate assistance when needed.

The Women Empowerment system is particularly beneficial for women as it improves their safety. It uses technology to achieve this and offers help quickly when needed. Women can rely on the SheSafe system during emergencies. The system is effective because it responds rapidly when women are in danger, which is critical.

Accessing the system is straightforward. All safety features are located in one place, which is convenient. If something bad happens, users can send a panic alert that shares their location and requests help. The system also allows users to call trusted friends or family for support and shows them the nearest police station. This feature enables quick assistance during stressful situations. The safety tools in the system are user-friendly and effective.

4.1 Offline Crime Data Analysis and Model Training

The offline component is crucial for creating a reliable machine learning model. It analyzes crime data stored in CSV files. This data includes information such as the year, location, and types of incidents affecting women. The crime data helps us track trends over time, which is vital for the machine learning model.

First, we clean the dataset. We correct any errors and remove irrelevant information to ensure that the dataset is reliable. A consistent dataset makes our work easier.The dataset's features are essential for the machine learning algorithms.

The dataset features aid the algorithms in learning effectively.The machine learning algorithms require these features to perform well.

Next, we split the data into two parts: the training set and the testing set. The training set teaches algorithms like Linear Regression and Random Forest about crime patterns, helping them improve their predictive abilities. After examining all the models, we conclude that the Random Forest model is best for this project. It excels at handling complex crime data influenced by various factors. Therefore, we choose the Random Forest model for our work.

The trained Random Forest model is ready for use. We can rely on it for predictions. Now we can utilize the

Random Forest model for risk assessments when necessary.We conduct our training offline, allowing the system to make predictions whenever required. The Random Forest model is vital for ensuring our real-time prediction system functions effectively. We use this model to guarantee timely predictions.

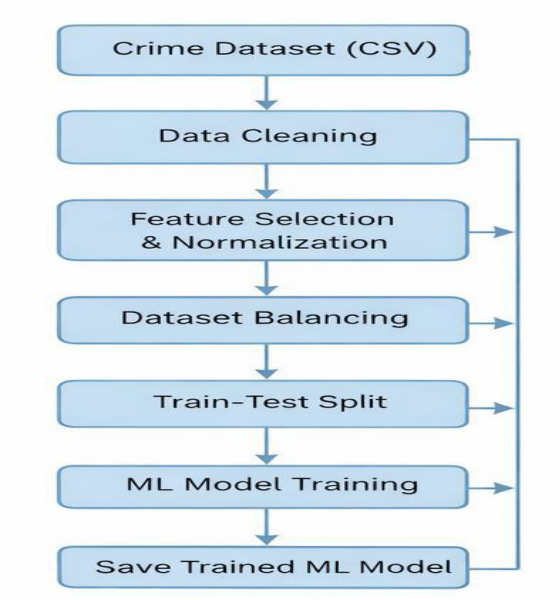

Figure 1: Offline ml training flow

4.2 Real-Time Crime Risk Estimation and Panic Support System

The real-time module is highly beneficial for users, helping them stay safe while using the application.When users log into the application, they will find all safety tools in one place, the safety dashboard. This dashboard provides everything users need to remain secure.

This layout is advantageous because it allows users to access tools easily. All necessary features are readily available.The real-time module enhances the user experience by offering all the safety resources in the dashboard. It makes finding information straightforward and useful.

In emergencies, users can utilize the panic alert feature. This feature pinpoints their location through browser services and generates a Google Maps link to share with their emergency contacts. This enables users to get help quickly, making the panic alert feature crucial in urgent situations by providing location details through Google Maps.

The system also helps users locate the nearest police station, which is particularly useful if they are away from home and unfamiliar with the area. The integration of the system and Google Maps facilitates this search. The police station is often the critical resource needed during emergencies, and the system makes it easier to find.

The emergency resources component of the system is vital as it provides necessary support when required. These resources contribute to the overall usefulness of the system.

All information is presented clearly and in a user-friendly manner. We prioritize clarity, correct spelling, and alignment to minimize confusion during stressful moments. By integrating machine learning predictions, real-time alerts, location services, and emergency resources, the real-time module ensures users are prepared to respond swiftly

V. SYSTEM ARCHITECTURE

The Women Empowerment system is really simple and easy to understand. It is based on a web system that was made using the Django framework. People can use the women empowerment system by going to a website with their computer browser. When they get to the website they can log in. Then they can use all the safety features that the women empowerment system has. These features are easy to find and use because they are all on a dashboard. The Women Empowerment system is, about keeping people safe and it does this with a simple web-based system.

The Django backend is responsible for a lot of things. It handles user authentication and request processing. It also makes sure different modules work together smoothly. The Django backend stores user details in a MySQL database, in a secure way. When the Django backend needs these details it retrieves them from the MySQL database.

The machine learning module is a part of the Django backend. This module uses a model that was trained beforehand to figure out how likely it is that a crime will happen. The machine learning module looks at what happened in the past to make these guesses about crime risk levels.

This architecture ensures fast response, reliability, and smooth interaction between prediction, alerting, and emergency support components.

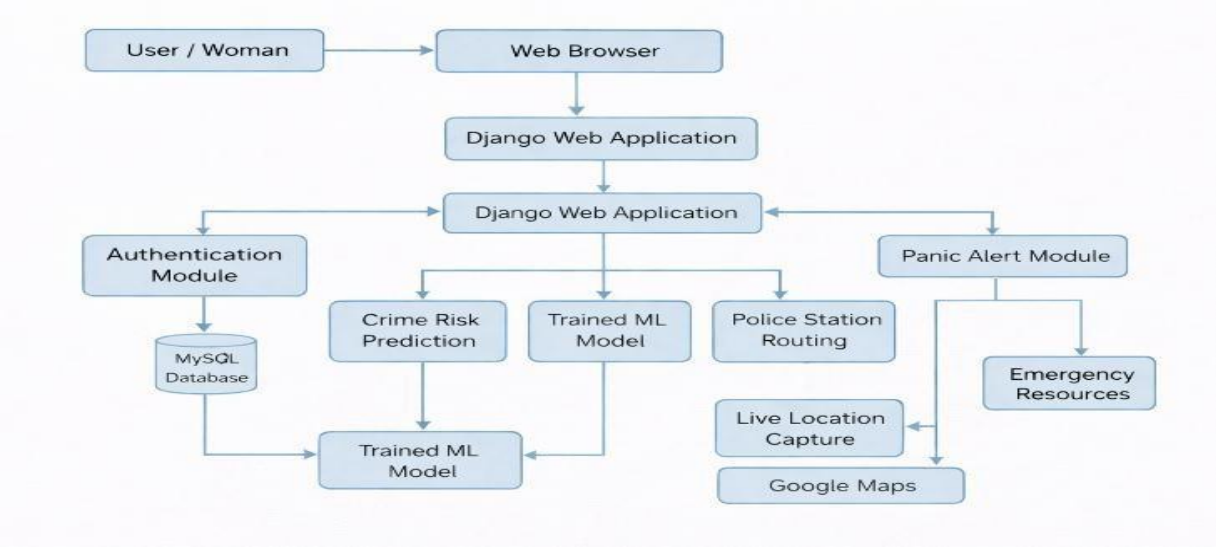

Figure 2: System Architecture

Figure 3: Model Performance

6.5 Procedure for Risk Estimation and Emergency Response

The Women Empowerment System is really simple. It has some important parts. These parts are:

1. Collecting historical crime data for model training.
2. Preprocessing and normalizing the data.
3. Selecting and extracting relevant features.
4. Estimating crime risk using a trained machine-learning model.
5. Activating panic alerts with live location capture.

6. Sending email notifications and providing access to safety resources.

This structured method ensures timely alerts, accurate risk assessments, and quick emergency support, ultimately improving safety and preparedness for women

VII. RESULTS

The implemented system was then tested for its efficiency in crime risk estimation and support in emergency responses. From the test results, it is evident that early risk awareness and timely support during panic situations are possible from an integrated web-based platformWe have trained the machine learning module on historical crime data and tested it with unseen samples.

The predicted outputs are mapped to simple categories of Low, Medium, and High, thereby making the results quite easy to understand for the end user who is nontechnical.

The panic alert module was tested in various scenarios, capturing the user's live geographical location at the time of pressing the panic button and generating a Google Maps link. Similarly, the module of emergency resources provided immediate access to helpline numbers that were verified and click-to-call-enabled.Furthermore, routing for police stations correctly displayed the locations of police around them using Google Maps, improving accessibility to emergency assistance.

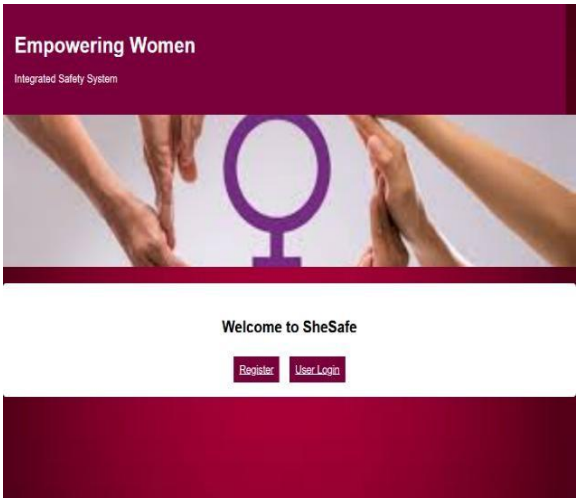

Figure 4: Register & Login Page

The interaction between a user interface, back-end logic, a machine learning model, and external services was smooth in overall system testing. The system remained stable during repeated testing; all core features operated as intended. These results confirm that the Women Empowerment System effectively integrates predictive analytics with real-time emergency support to improve personal safety.

7.1 Crime Risk Prediction Result

The crime risk prediction module was tested using historical crime data related to crimes against women. When the user selects a state and enters a year, the trained machine learning model successfully generates a risk level.

The prediction output is displayed in a user-friendly format showing:

- Selected State
- Entered Year
- Predicted Risk Level (Low / Medium / High)

The use of simple risk categories ensures that users can easily understand the safety level without technical knowledge. The results remained consistent for repeated inputs, indicating stable model behavior.

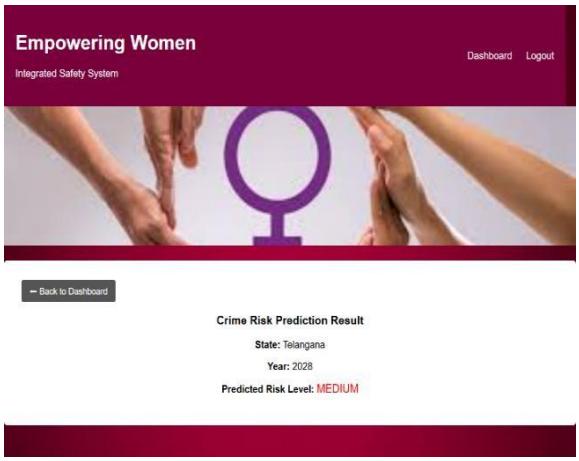

Figure 5: Crime Risk Prediction

7.2 Panic Alert System Result

The testing of the panic alert module was done in various scenarios. If the panic button was activated: The system captured the user's live latitude and longitude.A Google Maps link has been automatically generated. An emergency email was sent to the registered contact.

The alert was thus delivered within a short time interval to ensure on-time notification. This illustrates the real-life effectiveness of a panic mechanism when it comes to emergency situations.

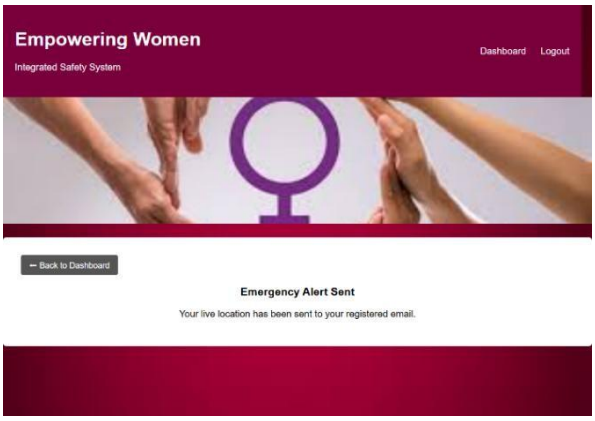

Figure 6: Panic Alert System

7.5 Police Station Routing Result

The police routing feature was tested by entering different area names. The system successfully displayed nearby police stations using Google Maps embedding.

Additionally, the entered area name was shown on the result page, confirming correct data flow from user input to output display. This feature improves accessibility to nearby law enforcement services.

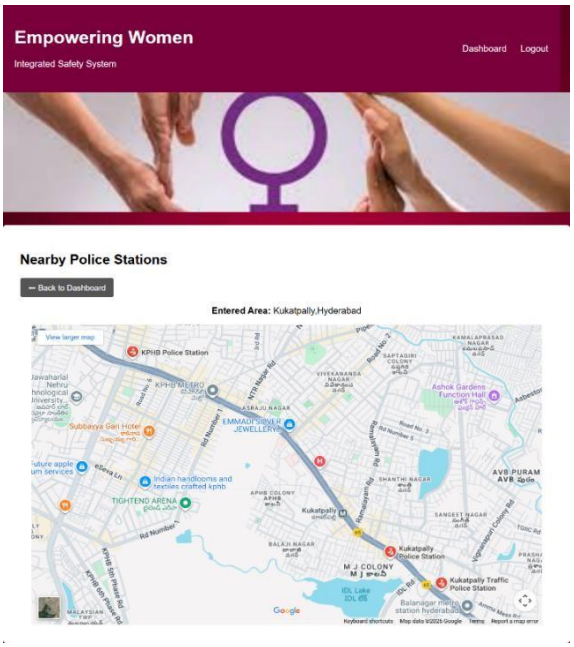

Figure 7: Police Station Routing

7.6 Emergency Resources Module Result

The emergency resources module provided instant access to verified helpline numbers such as women helplines and police emergency contacts. The click-to-call buttons functioned correctly on supported devices, reducing the time required to initiate emergency communication. This module enhances usability by allowing users to reach help with minimal interaction.

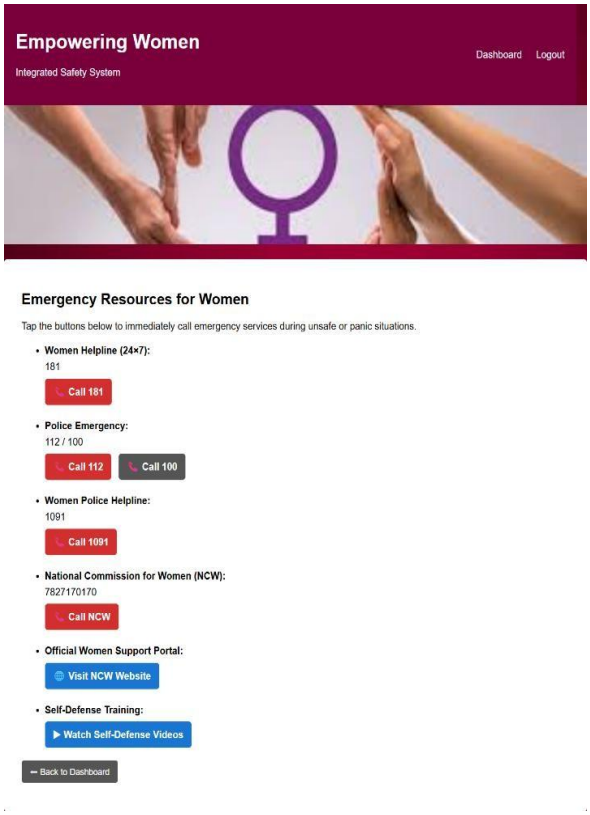

Figure 8: Emergency Resources

VIII.CONCLUSION

The Women Empowerment System is really good, at showing how we can use the internet and computers to help keep women safe in emergencies. It uses a few tools like figuring out where crimes might happen and a special alert button. The Women Empowerment System also lets people share where they are now and find trusted help when they need it. All of these things are part of a website that is easy for anyone to use. The Women Empowerment System is very helpful because it puts all these tools together in one place.

The crime data from the past is used to help people know if they are in a place. This is done by a computer program that looks at the crime data. The program gives people an idea of what might happen so they can

be careful. When something bad happens the panic alert feature helps people get help fast. It does this by finding the persons location and sending a message to the people they trust. The police can also be found easily. People can call them quickly when they need help. This makes it easier for people to get the help they need when they are, in a situation. The crime data and the panic alert feature and the police help all work together to keep people safe.

The system is made to be simple and easy to use. This makes the system work well in the world even when things get really tough. All the main parts of the system worked correctly when we tested them. The system performed well overall which shows that using predictive analytics with emergency response, in real time is a good idea. The system and the predictive analytics are a combination. The Women Empowerment System serves as a practical and scalable solution that supports women's safety through timely alerts, informed decision-making, and rapid access to assistance. The project highlights the potential of technology-driven approaches in addressing social challenges and lays a strong foundation for future enhancements.

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