Chatbot Android Application for Smart Personal Safety Using Machine Learning

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***Abstract*—Personal safety has become a major concern, especially for individuals who may face emergencies in public or isolated areas. This project proposes a Smart Personal Safety Android Application that combines Machine Learning, Chatbot interaction, Google Maps, and an SOS alert system The application is built using Android Studio and Kotlin for the mobile interface, while Python-based Machine Learning algorithms such as Decision Tree and Random Forest analyse behavioural and location data. The chatbot understands message-pattern recognition approach, where it monitors user messages to detect distress or abnormal conversation tone. When risk is detected, the ML model automatically activates the SOS function, sharing the live location through Google Maps API with emergency contacts. This intelligent integration enables real-time assistance, proactive detection, and efficient communication, providing a reliable and user- friendly framework for personal safety.**

***Index Terms*—Android Application, Chatbot, Decision Tree Algorithm, Emotion Detection, Google Maps Integration, Kotlin, Machine Learning, Natural Language Processing (NLP), Python, Random Forest, SOS System**

I. INTRODUCTION

Personal safety has become a serious concern in today's world. Existing safety apps mostly rely on manual SOS alerts, which may fail during emergencies. To solve this issue, this project proposes a Smart Personal Safety Android Application that uses Machine Learning, Chatbot interaction, Google Maps, and an SOS system. The chatbot applies online message-pattern analysis to detect distress, while Decision Tree and Random Forest algorithms help predict risky situations. When danger is identified, the app automatically shares live location via Google Maps API. Developed using Kotlin and Python. The system ensures fast response, intelligent and a user-friendly experience for personal protection.

II. LITERATURE SURVEY

The authors in [1] proposed a smart personal safety framework using Artificial Intelligence and Machine Learning to monitor user behavior and detect distress signals. The chatbot analyzes text patterns using Natural Language Processing (NLP) and initiates automated SOS alerts to emergency contacts. The study demonstrated that integrating AI chatbots with machine learning models can effectively identify risk situations and assist users during emergencies.

The authors in [2] developed an Android-based personal safety system integrated with Google Maps for real-time tracking. The application automatically shares the user's location and sends SOS alerts to trusted contacts when danger is detected. Their research emphasized the role of GPS and location-based services in minimizing emergency response times and enhancing situational awareness.

The authors in [3] focused on identifying unsafe areas using machine learning algorithms applied to geospatial and incident data. The system computed a safety index for different routes and recommended safer alternatives to users. By integrating this predictive model with a mobile chatbot, the system provided proactive safety alerts rather than only reactive responses.

The authors in [4] investigated AI-driven conversational models capable of understanding user emotions to predict distress. Their research demonstrated how neural networks and sentiment analysis could be used to create intelligent chatbots for personal safety. The study showed that emotional recognition enhances user engagement and helps detect panic conditions early.

The authors in [5] presented a chatbot model capable of detecting emotional stress through text and voice

inputs using sentiment analysis. Once distress was identified, the system automatically contacted nearby emergency responders. The research laid the foundation for combining voice analytics and NLP techniques in personal safety systems.

The authors in [6] designed a context-aware Android application using motion and GPS sensors to monitor user activity. A Decision Tree algorithm detects unusual movements, improving accuracy and enabling real-time mobile safety alerts.

The author in [7] used machine learning to predict potential safety risks and emergency situations. The model analyzed user behavior, location patterns, and message tone to estimate possible danger. It enabled early detection and faster response during emergencies.

The authors in [8] Implemented a context aware authentication system using ml algorithm to monitor environmental and behavioral cues Originally for cybersecurity, it also enhances personal safety by detecting unauthorized access or coercion, improving the reliability of safety systems.

The authors in [9] demonstrated how Google Maps API can be used to design a smart route navigation system that highlights safe zones and nearby emergency services. The integration of map-based data visualization ensures users can navigate securely and reach safe locations quickly in case of emergencies.

The authors in [10] developed an emotion-aware chatbot using deep learning techniques to assess the urgency level of user messages. By classifying the emotional tone of communication, the system decides whether to activate an SOS alert automatically. This study showed how emotional intelligence in AI models can enhance human safety and trust.

The authors in [11] designed a cloud-supported personal safety model that processes real-time data from smartphones. Machine learning algorithms analyze motion, GPS, and voice patterns on the cloud to verify genuine emergencies. This hybrid system improved accuracy, scalability, and processing speed during alert activation.

The authors in [12] explored motion-sensor-based classification for personal attack and accident detection. They trained ML models using accelerometer and gyroscope data to recognize sudden movement changes. This study contributed to developing wearable and mobile solutions for real-time personal protection.

The authors in [13] proposed a voice-activated personal safety system that detects distress tones using machine learning and signal analysis. The system automatically sends SOS messages along with the user's GPS location. The integration of voice analytics improves safety for situations where manual operation isn't possible.

The authors in [14] introduced a hybrid machine learning model that combines decision trees and neural networks to predict high-risk zones. The model used historical safety data and online reports to refine predictions. This multimodel integration improved forecasting precision and overall system adaptability.

The authors in [15] designed "Safe Connect," a smart personal safety assistant that integrates AI chatbot interaction with emergency communication. The chatbot provides emotional reassurance while coordinating with verified contacts and emergency services. This system demonstrated how psychological and physical safety could be combined into a single intelligent platform.

The authors in [16] used ML for real-time personal safety analysis and distress detection. The model classified user behavior and message patterns to identify potential risk situations. This helped in predicting emergencies and triggering early alerts.The authors in [17] surveyed various personal safety prediction techniques used in literature.The paper concluded that machine learning-based alert systems are more accurate than traditional manual SOS methods. It highlighted multiple AI and chatbot approaches with performance comparisons.

The authors in [18] reviewed multiple AI-based personal safety and emergency response systems, emphasizing that machine learning enhances speed and decision quality. Their analysis concluded that chatbot-assisted models reduce human error and improve the consistency of emergency communication.

The authors in [19] developed an Android application to provide intelligent personal safety assistance in real time. This digital system allows users to receive instant emergency support without manual SOS activation. The approach improved accessibility and response speed but required continuous internet connectivity.

The authors in [20] integrated AI techniques into Androidbased personal safety systems. The research enabled faster emergency detection and automated alert delivery through chatbots.Artificial Intelligence

reduced manual SOS dependency and improved response efficiency. However, the system's accuracy still relied on proper user input and consistent data collection.

Table 1.a Chatbot (Text-based, NLP, Emotional/Safety Support)

Sr. No	Author & Year	Algorithm used	Advantages	Disadvantages	Tools used
1	M.D.R. Haque, A. Rahman, and F. Chowdhury, 2023	NLP, Sentiment Analysis	Supports emotion-based conversation for mental well-being	Limited ability to understand complex emotions or sarcasm	Python, TensorFlow, AndroidSDK
2	P. Rathnayaka, A. Jayawardena, and J. Wijerante, 2022	ML with Behavioural Activation Algorithm	Personalized behavioural suggestions; real-time mental health monitoring	High Dependency on training data; privacy risks	Dialogflow, firebase, python
3	B. Kang, H. Lee, and S. Park,2025	CNN for Emotion Recognition	Improved accuracy in detecting emotional tone in text	Requires large labelled emotional datasets	Keras, python, android studio
4	N. Singh and P. Kushwaha, 2024	Rule-based AI model	Interpretable and easy to deploy	Limited learning capacity	Flask, pyhton
5	T. Zhang, S. Chen, and X. Liu,2022	Transfer Based NLP (BERT)	High contextual understanding of user input	Computationally heavy	BERT, python, Pytorch
6	A.Y. Khan, R. Basha, and M.B. Patil, 2023	GPS-Based Alert Algorithm	Provides real- time user location during emergency	GPS inaccuracy in low-signal zones	Android studio, java, Google Maps API
7	M. Ashikuzzaman, S. Rahman, and M.S. Islam, 2025	CNN+Sensor fusion	Detects potential danger situations using motion	High power consumption	Tensorflow Lite, Android SDK

Table 1.b Android Application (Smart Safety App Design & Development)

Sr. No	Author & Year	Algorithm used	Advantages	Disadvantages	Tools used
1	R. Kaur and M. Singh, 2024	Reinforcement Learning (RL)	Learns optimal strategies for real-time emergency response	Complex training process	Python, OpenAI Gym, TensorFlow
2	P. Minakshi, S.K. Gupta, and A. Mittal, 2024	Naïve Bayes Classifier	Lightweight and fast	Limited accuracy with complex or unstructured data	Android studio, firebase, python
3	A. Padmavathi, V. Shashini, and J.C. Ryan, 2024	Decision Tree Algorithm	Effective for spam alert management and decision making	Overfitting with small datasets	Java, SQLite, Android SDK
4	D.S. Gaurav and R. Mishra, 2023	Support Vector Machine (SVM) with text analysis	Accurate text classification for emergency message detection	Requires text preprocessing	Python, Scikit-learn, NLTK

Table1.c Machine Learning (Decision tree, Random Forest, NLP models)

Sr. No	Author & Year	Algorithm used	Advantages	Disadvantages	Tools used
1	M. Javed, R. Ahmad, and K. Rahim, 2023	Fog computing model	Reduces latency in SOS systems	Requires additional hardware	IoT Framework, python
2	T. Li. X. Zhu, and F. Liu, 2019	MAD-GAN (Multivariate Anomaly Detection using GAN)	Detects anomalies in time- series emergency data	Computationally expensive	Tensor flow, keras, python
3	S.D.S. Shwet a and P. K. Preethi, 2025	Logistic Regression	Simple implementation	Low accuracy on complex	Python, Scikit-learn
4	M. K. Hassan, S.S. Alam, and N.A. Rahma n, 2021	Location based ML clustering	Realtime location-based altering	GPS accuracy issues	Android Studio, Java, Google maps API

Table 1.d Google Maps / GPS Integration and SOS and Emergency alert system

Sr. No	Author & Year	Algorithm used	Advantages	Disadvantages	Tools used
1	P.S. Pawar et al, 2025	Random forest	Robust against noise	Requires large dataset	Python, firebase, android studio
2	Y.K. Byung, S. Chang, and S.J. Choi, 2021	5G + ATSC 3.0 Convergence Algorithm	Real-time emergency broadcasting	Needs advanced infrastructure	MATLAB, 5G Simulation tools
3	Y.K. Byung, S. Chang, and S.J. Choi, 2021 (Duplicate)	Same as above	Same as above	Same as above	Same as above
4	M. Brown and L. Green, 2021	Mobile Panic Detection algorithm	Low latency alert system	Requires continuous connectivity	Android SDK, java
5	V. Lakshmi, N. Reddy, and P. Singh, 2023	ML-based SOS trigger algorithm	Simplified user interface	Works only on Android	Android studio, java, firebase

III. PROPOSED SYSTEM

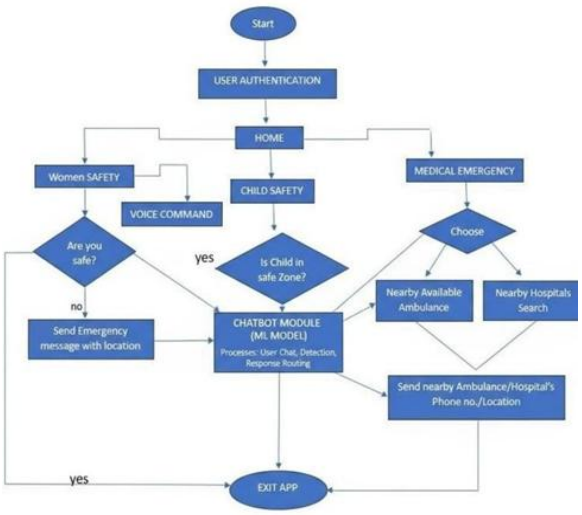

Fig.3. Architecture of the Proposed System

System Architecture Description

The proposed system is an Android-based Smart Personal Safety Application integrated with a Machine Learning powered chatbot. The architecture is modular and designed to provide real-time emergency assistance. The system starts with User Authentication, ensuring secure login and access control. After authentication, the user is directed to the Home Module, which provides three main safety services: Women Safety, Child Safety, and Medical Emergency.

In the Women Safety Module, the system checks whether the user is safe. If the user indicates danger, an emergency message with live GPS location is automatically sent to predefined contacts. The system also supports voice command activation for hands-free emergency triggering.

In the Child Safety Module, the system verifies whether the child is within a predefined safe zone.
If the child exits the safe boundary, the system forwards the alert to the chatbot module for further processing and necessary action.

In the Medical Emergency Module, the user can search for nearby ambulances or hospitals. Based on the selection, the system retrieves and displays nearby medical services along with contact numbers and location details.

The Chatbot Module (ML Model) acts as the core component of the system. It processes user inputs using Natural Language Processing techniques and classifies the intent as normal or emergency. If an emergency is detected, the chatbot automatically triggers appropriate actions such as SOS alerts, location sharing, and emergency notifications.
The system ends with a secure exit after completing the required operation.

IV. FUTURE SCOPE

In the future, the proposed system can be enhanced by integrating advanced voice recognition technology to automatically detect emergency keywords without requiring manual input from the user. The application can also incorporate AI- based emotion detection using voice tone analysis or facial expression recognition to identify distress situations more accurately.
Integration with wearable devices such as smartwatches and fitness bands can enable instant emergency triggering even when the mobile phone is not easily accessible. Real-time audio and video streaming features can be added to provide live evidence to emergency contacts during critical situations.
The system can further be improved by implementing continuous cloud-based learning to enhance the accuracy of the Machine Learning model over time. Multilingual chatbot support can be introduced to assist users in different regional languages, making the application more inclusive.

V. CONCLUSION

The proposed Chatbot Android Application for Smart Personal Safety using Machine Learning effectively enhances personal security by combining intelligent text based chatbot interaction, machine learning-based risk detection, and real-time GPS tracking. By analyzing user messages through NLP and ML algorithms such as Decision Tree and Random Forest, the system identifies potential distress situations and automatically triggers SOS alerts with live location sharing via Google Maps. This approach improves emergency response time and ensures a reliable, user-friendly safety framework.

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