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Assessment And Exploring Of Women's Safety Using Machine Learning Techniques

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Abstract: Nowadays, women face numerous challenges related to their safety; even in today's society, women's protection remains a challenge, despite significant technological advancements. Not all places guarantee women's safety, especially when they travel alone through desolate roads and abandoned areas. Emerging hand-held safety features for women require physical activity, such as pushing a button or shaking a machine, to activate the system after detecting a threat. We suggest alternatives that seek to resolve the shortcomings of current structures and provide women with false evidence of protection. We are building an IoT-based safety device with the help of the research framework. It works by forming partnerships with protection through a signature method of connected devices and alerting nearby family members and police stations when a woman is not safe. In addition, an explosion machine is also built for first-hand protection, which women may use to strike the attacker. The development design also incorporates additional functionality, such as the ability to submit community notifications and record voice messages. The development design includes a mobile app for women's protection, which displays safe places on the map based on the victim's current position, enabling them to access the secure place from their current location.

Keywords: Natural Language Processing (NLP), Machine Learning (ML), Artificial Intelligence (AI), and Deep Learning

INTRODUCTION

Physical devices, referred to as electronic devices, link the Internet of Things, cloud computing, and sensors. The confidentiality of the Internet of Things is very high. Developing smart-based security greatly benefits individuals. We create the sensors in such a way that they respond automatically without any triggering buttons. This will help individuals solve challenges such as women's security and the development of a smart city. We use sensed data for safety purposes, including flux sensors, vibration sensors, sensory characteristics, heartbeat sensors, and GPS. The GPS pinpoints the location. The IOT transmits the location and sends a warning if there is a significant shift in the nearest police station's heartbeat level. If the tilt sensor detects any abuse, such as bending, inclinations, vibrations, or other modifications, it will send a message. The suggested device utilizes Arduino and Raspberry Pi 3. The proposed application provides a protective framework that enables women to perform their jobs safely and comfortably in their preferred positions. We use body sensors and GPS for location monitoring and message transmission to local police stations and families. This work involves the study and analysis of various IoT and machine learning applications for women's safety, culminating in the development of a machine learning application for the Women and

Child Safety System (WCSS). The system also develops an IoT module that generates real-time data for activity recognition, predicts safe and unsafe zones based on the GPS data set, and validates the system using a hybrid machine learning algorithm (SVM, Naive Bayes classifier) for effective classification of women's activities.

LITERATURE SURVEY

In [1] the design of this cutting-edge Internet-of-Things device is to collect data while enhancing the security and safety of women. The system includes GSM and GPS modules, a flex sensor, a digital camera, a buzzer sensor, and a Raspberry Pi. Women can easily and discreetly wear the compact device within their undergarments, providing both convenience and comfort.

In [2] they introduce a high-tech device for women's safety that uses pressure, heart rate, and temperature sensors to automate the emergency alert process. It autonomously identifies potential threats through outlier detection..

In [3] An IoT device paired with an Android application can significantly improve the safety of women while on the move. In the event of an emergency, the gadget can monitor the user's whereabouts in real time and notify volunteers and local police stations. Additionally, it can alert the user about the nearest safe zone. The device incorporates components like an Arduino Nano, GPS, GSM, Bluetooth, among others.

In [4] situations where a woman's safety is at risk, an IoT-powered safety device employs a fingerprint authentication system to ensure her protection and alert nearby individuals and authorities. The fingerprint verification detects a potential threat within a minute and instantly notifies others and the authorities if the device fails to receive a signal. Furthermore, we have designed a shockwave generator for personal defense, enabling women to defend themselves against attackers. The proposed system also includes additional features, such as the ability to send group messages and record audio.

In [5] the system functions as both an alarm and a security mechanism. When activated, it triggers a buzzer alarm to alert those nearby the user, who is wearing the smart device. The system utilizes GPS to determine the user's place and sends this data via SMS to emergency contacts and law enforcement using GSM and GPRS technology. Additionally, the device captures images of the attack and the surrounding area through a USB webcam, which are then emailed as an immediate alert to the alternative contact once the alarm button on the smart wearable device is pressed.

According to [6] create an automated method for heart attack prediction, researchers have proposed using deep neural network technology. We evaluated the accuracy of machine learning techniques using different datasets. The proposed method incorporated an automated data preprocessing technique to eliminate any anomalies from the system.

According to [7] they introduced the Talos hyperparameter optimization system to predict heart and cardiac diseases. Cardiac conditions represent a crucial area where deep neural networks can improve the accuracy of heart disease classification. Techniques such as SVM, Naive Bayes, and Random Forest exhibit different levels of performance in classification tasks. The Talos optimization method outperformed these other algorithms in classifying data from the UCI heart attack dataset.

In [8] a group learning system that used a CNN and one-way and two-way BiLSTM or BiGRU models was able to diagnose different heart diseases 91% of the time. This method utilizes data preprocessing & feature selection to enhance the show of the classifier.

Researchers in [9] the suggested method uses patient diagnostic narratives along with deep neural networks (RNNs), mainly the PPRNN model, and a learning algorithm to make better predictions about what will happen. The PP-RNN uses more than one RNN to look at different sets of diagnostic data from patients and guess when high-risk diseases will start.

In reference to [10], researchers have developed an innovative medical application based on cloud computing and IoT to track and detect critical illnesses. In the training phase, the SVM classifier is trained using data from the validation set. We used real patient data for system testing to detect various illnesses and diagnose the presence of diseases.

Existing System

2.1 Wearable technology and the Internet of Things in people safety

The developments in wireless networking, sensor innovation, and downsizing have remarkably grown wearable technology. According to researchers [11], wearable devices show enormous potential for health monitoring and are particularly suitable for personal safety

applications. Integrating IoT technology further enhances their functionality by enabling real-time data transmission and processing [12]. The popularity of wearable IoT devices stems from their portability and sophisticated features. Studies by [13, 14] emphasize advancements in wearable health monitoring systems, highlighting their role in continuous health tracking and emergency alert systems.

2.2 Wearable technology for the protection of women

Various studies have investigated wearable technologies aimed at improving women's safety. Divers Knowledge has created a wearable device featuring GPS or GSM modules to transmit emergency alerts along with place info. Study by [15] presented a smart wristband featuring an alert button and real-time tracking, showing enormous promise for improving individual safety. The uses of wearable devices for own protection has been a significant area of focus. For instance, [16] investigated various wearable technologies aimed at increasing safety, such as emergency alert buttons, GPS-based trackers, and communication tools.

2.3. Advanced sensing or biometric monitoring

Augmented detecting capabilities, particularly in biometric 24-hour care, play a vital role in improving the performance of wearable safety systems. Study by [17] explored non-invasive biometric devices that can continuously track physiological indicators and identify signs of stress or discomfort. In the same way, [18] demonstrated how wearable devices can assess a user's emotional state by monitoring heart rate variability and skin conductance, offering an added layer of security. The study by [19] on alternative response systems best part the standing of real-time data transmission and processing for more effective responses. A later study by [20] showcased how IoT-based solutions can automate emergency response actions, thus improving the reliability and efficiency of these systems.

RESEARCH EMTHODOLOGY

The challenging conditions confronting women today inspired the development of a safety gadget to aid the community in accomplishing their desired tasks. The program empowers women to overcome their fear and to navigate and oversee their responsibilities autonomously. We present an innovative technique for human activity recognition (HAR) using numerous sensors inside smartphones. We used an open-source dataset collection (UCI) that included several smartphone sensors for data acquisition. Subsequently, we used a machine learning technique to train the data. We used this model to forecast and assess the six daily tasks performed by individuals. We randomly divided the acquired dataset into two subsets, allocating 70% of the participants for training and 30% for testing. We partitioned the data into two segments, each suitable for independent use.

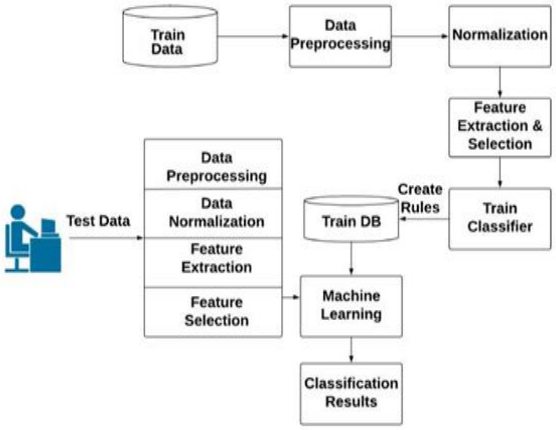

Figure 1: Research methodology of proposed system

Data Collection

We collect data from multiple platforms, including the UCI Machine Learning Repository, Kaggle, and various real-time sources. Before performing classification tasks, it is essential to preprocess the data to improve results by handling missing values and eliminating unnecessary features present in the selected dataset. Efficient and prompt processing of the dataset is crucial to achieving optimal outcomes in the data mining process.

Pre-processing and normalization

The data frequently includes irrelevant information and missing values that require attention. The data preparation process manages this. At this stage, various preprocessing methods are applied, including data cleaning, data transformation, and data reduction, to enhance the quality and usability of the dataset.

- **Data cleaning-** This process addresses noisy data, missing values, and other issues. We employ various methods to handle incomplete data, such as filling the missing values or removing the affected tuples. Data may also have null values that machines cannot interpret. Such noisy data can arise from errors in data collection or inaccurate data entry. We use techniques like regression, clustering, and

binning to effectively manage these challenges.

- **Data transformation-** This method transforms the data into a format suitable for the mining process. It involves steps such as normalization, attribute selection, and discretization to prepare the data effectively.

Feature extraction and Selection

This process extracts a range of features from the input data. A feature selection threshold refines the selected features, eliminating redundant and irrelevant attributes to improve training efficiency. A normalized set of data with relational properties is used to create hybrid features, and the right optimization method is picked for training. We apply a hybrid approach to select the most relevant features from the fully extracted set, thereby improving the classification accuracy. During feature extraction, many irrelevant elements emerge, requiring careful elimination when determining the optimal subset. The advantage of this approach lies in providing tailored feature selection for each distinct feature set.

Classification:

Once the module executes successfully, it passes the chosen features to the training module, which generates comprehensive background knowledge for the entire system. Once the trained model is ready, we can provide test data to obtain classification predictions. The testing phase involves preprocessing the test data, vectorizing it, and performing classification. During module testing, we evaluate the system's predictive accuracy using hybrid machine learning techniques. This stage measures the system's performance across various datasets.

CONCLSUION

The evaluation and investigation of women's safety via machine learning methods provide a potential strategy for addressing and alleviating the issues of women's security in both urban and rural settings. Utilizing data-driven insights, we can detect and forecast possible danger areas, examine trends in safety-related occurrences, and provide actionable suggestions to politicians and law enforcement authorities.

FUTURE SCOPE

Future women's safety solutions have enormous potential to provide individualized, proactive, and scalable protection mechanisms by fusing machine learning or deep learning with IoT, mobile technology, and community participation.

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