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GUARDPATH : AI Powered Personal Safety and Smart Route Planner

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ABSTRACT:

GuardPath AI is an artificial intelligence-based personal safety and smart route planning system that is designed to offer safer travel recommendations to users like women and students. Traditional route planners usually consider distance, time, and traffic conditions in their recommendations. However, the proposed solution is innovative and adds safety analysis to the mix, thus providing a much-needed alternative for people who care about their personal safety.

The proposed system would allow users to enter the starting point and destination, and it would calculate the safety level based on the available data. Using AI-based safety prediction, the best and safest route would be recommended instead of the shortest or fastest one. Moreover, the system would include the guardian mode for trip monitoring and SOS assistance in case of emergency. The system would also include the trip history feature to keep a record of all travelled routes. These features would be offered in one product, thus addressing the problem in a much better way than traditional route planners.

In conclusion, the system is united by providing route planning, safety assessment, journey tracking, and emergency assistance. The paper describes how artificial intelligence analysis can be applied to enhance the classic navigation system into a safety-oriented travel aid. Thus, GuardPath AI, with its route-planning, hazard detection, and emergency assistance features, may be considered an innovative safety concept that brings about enhanced security when used as a travel companion.

Keywords: Artificial Intelligence, Emergency SOS, Journey Monitoring, Machine Learning, Personal Safety, Smart Route Planning

INTRODUCTION:

Women's safety has become a matter of priority, especially during commutes or travel. A woman faces the risk of harassment, theft, unsafe surroundings, sparsely populated areas, and delayed emergency services. According to the NCRB data analysis from 2021 to 2023, the crimes against women in major Indian metropolitan cities pose a severe concern, with Delhi, in particular, reporting high crime rates [1]. By 'safe route', I mean a route with a lower risk score predicted by factors like crime history, lighting, crowd, traffic, and time of commuting. Although there are various technological advancements to address the safety concerns, most solutions address only emergencies, location tracking or physical safety, not the safety of the route taken.

There have been various research works addressing the issue of women's safety by proposing technology-based solutions. D.

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G. Monisha et al. have developed FEMME, an integrated women-safety device using GPS, Bluetooth, an Android application, emergency alerts, video/audio recording, and a hidden-camera detector to aid during an emergency [2]. Hrucha Wankhade et al. have proposed a safety system using GPS and GSM to track the user's location and inform emergency services [3]. W. Akram et al. designed an IoT-based safety device that uses fingerprint verification to connect to the device and alerts nearby people and the police when the user is unsafe [4]. S. V. Balshetwar et al. have proposed an IoT-based women safety system comprising voice, heart-rate monitoring, camera monitoring, etc. [5]. All such research works emphasise the importance of GPS, IoT, sensors, and communicators for tracking and emergency support.

A second line of research looks at the safety of the route itself. Galbrun et al. treated safe navigation as a trade-off between distance and risk and used crime data to offer paths that balance the two [6]. Levy et al. proposed SafeRoute, a reinforcement-learning approach trained on crime reports [7], while Torres-Ruiz et al. [8] and Mata and Claremont [9] combined crowd-sensed or social-network information with official crime data to find safe paths. More integrated systems have also appeared. Safe Routes uses GPS, AI, and clustering to rate regions by safety parameters [10]. A women-focused safe-route system for Pune compared Random Forest and XGBoost on a curated crime dataset of 5,000 entries from 50 high-risk areas, using K-Means spatial clustering and hourly crime frequency analysis [11]. The Safe Route Advisor system rates routes with a danger index calculated from K-means crime clusters [12], and She Guardian combines GPS tracking, voice-activated SOS alerts, route deviation detection, and AI-based distress analysis [13].

But most such works deal only with the scenario of an emergency. Even the route-based and integrated studies mainly use crime-related data to choose a path [6]-[12], or concentrate on monitoring and alerts during the trip [13], and they do not combine route safety scoring, trip monitoring, SOS support, and image-based hazard reports from users in one application. There is a need for a system which can take into account the safety factor not only during emergency but also while commuting and can keep track of the journey to assure that it is the safest possible. A system that considers factors like safety reports from users, the lighting and traffic conditions of the route, and suggests accordingly.

I propose GuardPath AI to be an intelligent safety-focused route planning and travel assistant. Instead of focusing only on the distance and time, it considers the safety aspects of the routes and suggests a comparatively safer route to the user. This system comprises features like Guardian Mode to keep track of the journey, SOS assistance, trip history, and hazard reports. With the help of hazard reports, any user can report a blocked or unsafe road by uploading an image and filling out a hazard report form, and other users will be notified so that they avoid the particular route. By combining AI-based route safety analysis, a real-time travel assistant, emergency support, and community-based hazard reports, I intend that GuardPath AI can offer a better safety experience. The objectives of my work are (I) to build a machine-learning model (Random Forest) to calculate the safety score of a route, (ii) to recommend a safer route as opposed to the shortest or fastest route, (iii) to provide Guardian mode, SOS assistance, and trip history as a part of the real-time travel assistant, and (iv) to allow community-based hazard reporting along with image upload.

The scope of my work is limited to road commutes within the urban areas covered by the dataset used for training, and it is carried out using a web application with

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maps from OpenStreetMap and Leaflet. The system has some limitations, such as dependence on the internet and the accuracy of GPS; prediction accuracy depends on the dataset used, and hazard reports are user-generated and might not be verified.

This system is intended to aid a safer commute, but it cannot be a substitute for emergency services.

LITERATURE REVIEW:

Numerous researchers have proposed technology-based solutions to women's safety and suggested the use of various technologies like GPS, Bluetooth, Android applications, emergency alerts, video/audio recording and hidden-camera detectors to help women in case an emergency [2]; GPS and GSM to track the user's location and report to the emergency [3]; IoT-based safety device that uses fingerprint verification to connect, alert the nearby people and police if the user is not safe and noted that most of the existing handheld devices require the user to manually activate them once sensed with danger [4]; IoT-based women safety system comprising of voice control, heart-rate monitoring and camera monitoring [5]. The studies emphasised the importance of GPS, IoT, sensors and communication modules in tracking and emergency support.

A second line of research has concentrated on the safety of the route. Studies on crime modelling demonstrated that the distribution of crime is neither random nor uniform over a city but is localised in both space and time, which can be leveraged by utilising the records of past incidents to estimate the riskiness of particular places and times [6]. This idea has been utilised in crime-mapping tools for law enforcement and predictive systems in forecasting the likelihood of crimes to occur [6]. Researchers later extended it to everyday travel, so that a route is weighted by its riskiness and not just by its length. Galbrun et al. addressed safe urban navigation as a problem with two objectives, distance and risk, which cannot be merged into a single metric. They proposed a few paths with different risk and distance trade-offs and built a risk model for street networks from the crime data of Chicago and Philadelphia [6].

Machine learning has also been used to learn safe routes. Levy et al. developed SafeRoute, a deep reinforcement learning system that learns to select streets using a reward that combines safety and efficiency. Trained on crime reports from Boston, New York, and San Francisco, it improved on state-of-the-art methods by up to 17% in local average distance from crimes while decreasing path length by up to 7% [7]. A women-focused safe-route system for Pune compared Random Forest and XG Boost on a curated crime dataset of 5000 entries from 50 high-risk areas using K-Means spatial clustering and hourly crime frequency analysis [11]. The Safe Route Advisor system trains a K-Means model once on historical crime data to identify hotspots and rates each route with a danger index calculated by averaging the risk values of the clusters along it [12]. Safe Routes uses GPS, AI and clustering to rate regions by safety parameters such as crime rate and infrastructure quality [10].

Other studies have drawn upon information collected from people, not only on official records. Torres-Ruiz et al. built a mobile system for Mexico City that combines crime-related social media posts with official crime reports processed with an ontology and a Bayes classifier and suggests safe routes together with a confidence measure for different areas [8]. Mata and Claremont proposed a mobile trusted-path system that recommends routes with low crime and no theft reports using tweets and police data processed with a Bayes method and an adapted Dijkstra algorithm [9]. These works emphasise the

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value of crowd-sourced information in estimating safety.

Some recent systems have concentrated on the journey itself. She Guardian is an AI-based safety system that integrates GPS-based location tracking, voice-activated SOS alerts, route deviation detection and AI-based distress analysis and uses a community-based guardian network with continuous AI monitoring to reduce the dependence on manual emergency activation [13].

Research gap. Emergency-oriented devices depend on dedicated hardware or manual activation and respond only after danger has begun [2]-[5]. Route-based studies have shown that crime data and machine learning can support safe route selection [6], [7], [11], [12], and crowd-assisted systems have shown the value of user contributed information [8], [9] but these concentrate mainly on choosing a path. In-trip systems provide monitoring and alerts but do not evaluate the safety of the chosen route [13]. Very few combine route safety scoring, continuous trip monitoring, emergency assistance and hazard reports with images uploaded by users in one application. GuardPath AI is proposed to fill this gap with a Random Forest safety score, Guardian Mode, SOS assistance and community hazard reporting.

SYSTEM ARCHITECTURE

The architecture of GuardPath AI is divided into three layers, as shown in Fig. 1. The presentation layer runs in the user's web browser and contains the route planner, the interactive Leaflet map, navigation with Guardian Mode, the SOS panel and emergency contacts, hazard reporting and the chatbot. The application layer is a Flask server, exposing endpoints for the authentication, route prediction, SOS alerts, hazard reports, chatbot queries and the administrator dashboard. The intelligence and data layer consists of the safety engine, which is using the trained Random Forest model together with the city road network and area attributes to score the routes, as well as the training dataset and the storage for the users, alerts, hazard reports and uploaded files. Moreover, external services include OpenStreetMap for the map tiles and routing and Gmail's SMTP server, which is delivering the emergency alerts to the trusted contact.

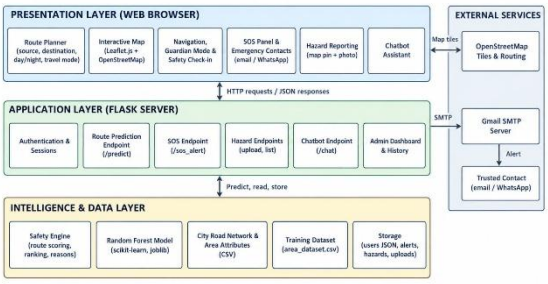


Fig.1 System Architecture of GuardPath AI

METHODOLOGY:

The method of the GuardPath AI consists of 10 consecutive stages ranging from the user registration/login to administrative monitoring of the system. Each step was described below in the consecutive points. The general idea is that after logging in, the user chooses the start point and destination, selects the time of travel (day/night) and the mode of transportation (walking, bicycle, public transport or car). First, the input data are validated, and the user is redirected to the route planning panel. Next, the attributes of each area on the possible routes are extracted and modified depending on the time of day. Then, the Random Forest algorithm is applied to predict the risk class for each area. The route options are evaluated and visualized in terms of safety, and the safest route is suggested to the user, which can be adjusted throughout the travel. During the movement, the user may change their mind about the route or have an emergency, and thus, several distress modules are available via the map panel. Finally, the user may report road hazards, which are later reviewed by the admin, and the chatbot provides assistance and information about the weather and route planning. Below are the main steps of the method.

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The ten stages of the workflow are summarized in **Fig.2**

1. User Registration/Login
The web application provides the option for the user to register and log in. All the data are stored in the session depending on the user's account, namely, the trip history, hazard reports, and SOS messages. The administrator has the access to the separate dashboard to monitor the activity on the website.

2. Plan a Safer Route
In the Plan a Safer Route panel, the user selects the source and destination, chooses the mode of travel, and indicates whether they want to travel at day or night. The Flask backend validates the entered details . If any fields is empty or the source and destination are the same , the request is rejected. If all inputs are valid, the user is directed again to the route planning panel

3.Preprocessing of the Data
For each area on the suggested routes, the crime rate, road condition, lighting, and traffic volume are extracted. For nocturnal journeys, the crime rate is increased by 1.5, and the lighting decreased by 2. The system takes safety-related attributes as input and passes them to a trained Random Forest classifier. The model analysis these attributes and predicts whether the selected location is Safe, Moderate, or Unsafe. Based on the prediction, the system displays a safety index between 0 and 100 , helping user's understand the predicted safety level of the location

4. Generate Safer Routes
All the possible routes between the selected points are generated on the city map (the road network is presented as a graph). The route safety score is calculated by summing up the area indices and normalizing it by the traffic volume based on the chosen mode of transportation. The higher safety score suggests a safer and faster route, considering the traffic conditions and the mode of transportation. Thus, each route is labelled as Safe, Moderate, and Unsafe, provided with the justification of the recommendation. The expected time of arrival is calculated based on the route distance, mode of transportation, and traffic volume. Finally, the route is visualized on the OpenStreetMap with Leaflet.js, highlighting the risk areas with different colours.

5. Navigation Panel and Guardian Mode
After selecting a route ,the user is taken to the navigation panel, where their current GPS location is marked on the map, and the journey progress and estimated time of arrival are displayed. Guardian Mode can be toggled on/off, and thus, the user can set the distance to the nearest police stations, hospitals, and bus stops. During the travel, the user can press the SOS button, and when the Guardian Mode is on, the distress signal will be sent to the predefined contact via email.

6. "Are You Safe?" Check-in
During the journey, the user is asked to confirm their safety by pressing the "Are you safe?" button on the full-screen modal window. There are three options: I'm Safe, I need help, and Cancel. If I'm Safe is selected, the modal window is closed, and the user continues to follow the route. If the I need help option is selected, the SOS distress signal is sent immediately. If the user did not respond within 30 seconds after the window appeared, the system will escalate the distress signal automatically.

7. SOS Emergency Assistance, Emergency Numbers, Friends and Family
The SOS distress signal can be sent manually from the map panel or automatically by the "Are you safe?" check-in window. The signal consists of the link to the Google Maps location, the editable message, and an optional voice memo and is sent via email to the predefined contact. The signal is also stored in the dashboard for the administrator to

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review. The device notifies the user by vibrating when the SOS mode is activated. The emergency numbers panel provides the contact numbers for emergency services in India (108, 100, 112). The users can add friends and family contacts with the call button and WhatsApp icon with the pre-written message.

8. Road Hazard Reporting
The users can report road hazards by pressing the report button, selecting the place on the map, writing the description, and attaching a picture if necessary. The report is reviewed by the administrator, and the hazard is marked on the map for other users with the description and the name of the reporter. Thus, the reported hazard can be avoided by the other users, and it is stored in the dashboard for administrative review.

9. AI Chatbot
The AI chatbot provides the assistance of the virtual assistant in the application. The chatbot is trained to answer the questions regarding the weather forecast and safe route planning and performs within the capabilities of the application. The weather-related questions are simulated in the chatbot.

10. History of Trips, Administrative Dashboard, and System Validation
The history panel stores the details of the user's trips, including the source, destination, the mode of transportation, and route type, and in the current version of the application, the sample data are presented. The administrative dashboard is used to review and monitor the user's activity, including the SOS messages and hazard reports. Besides, the admin can set up the email configuration to send the distress messages. Finally, all the components were integrated into the web application and tested for functionality validation.



Fig.2.Methodology workflow of Guardpath AI

TECHNOLOGIES

GuardPath AI is a web-based safety navigation system consisting of a machine learning safety engine, an interactive mapping interface, multimedia emergency alerts and community hazard reporting. It has a client-server architecture. The client side is built with HTML5, CSS3 and JavaScript, whereas the server side is Python and the Flask web framework. The technologies are described in the subsections below.

A. Machine Learning Safety Engine
A Random Forest classifier implemented with the scikit-learn library predicts the safety level of an area as Safe, Moderate or Unsafe based on four factors: crime rate, road condition, lighting condition and traffic level. The dataset was prepared with Pandas and split into training and testing sets in an 80:20 ratio with stratified sampling. The classifier uses 200 decision trees, a maximum depth of 8 and a fixed random state of 42 for reproducibility. The trained model is saved with joblib and loaded by the Flask application for prediction.

B. Route Safety Scoring
For each area on a candidate route, the model predicts class probabilities, converted to a 0 to 100 safety index by weighting the classes as Unsafe = 0, Moderate = 50 and Safe = 100:

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I(area) = Σ P(class | features) × W(class), with W(Unsafe) = 0, W(Moderate) = 50, W(Safe) = 100

The route score is the average of the area indices, weighted by the length of the adjacent road segments, adjusted for the travel mode (Table I) and reduced by a traffic penalty, and then capped at 0 to 100:

$S = \Sigma\, w(i) \times I(i) + A(mode) - 1.8 \times \max(0, T - 3)$

where w(i) is the normalized segment weight of area i, A(mode) is the travel-mode adjustment and T is the average traffic level along the route. Routes with S of 70 or above are classified as Safe, scores from 40 to 69.9 as Moderate and lower scores as Unsafe. The recommended route is highlighted together with up to five plain-language reasons generated from the average crime rate, lighting, road condition and traffic of the route. The estimated travel time is the route distance divided by the mode speed in Table I, increased by a traffic factor of 1 + 0.45 × T / 10.

TABLE I. TRAVEL-MODE ADJUSTMENT AND ASSUMED SPEED

Travel mode	Score adjustment	Assumed speed (km/h)
Walking	-8	5
Bicycle	-4	15
Public transport	0	25
Car	+5	35

C. Frontend and Mapping

The user interface is developed with HTML5, CSS3 and JavaScript. The maps are rendered with Leaflet.js with OpenStreetMap tiles, and the selected route follows road geometry obtained with OpenStreetMap-based routing. The routes are color-coded by risk level, but the traffic colours are a prototype visualization of the traffic values in the dataset. During a trip, a moving marker indicates the progress and estimated time remaining, with controls to start, pause, stop and reset. Police stations, hospitals and bus stops are shown as coloured markers, with the distance to the nearest one displayed during the trip. The interface uses blurred pop-up windows, smooth transitions, and a flexible layout that adjusts to different screen sizes.

D. Backend

The server is mainly developed with Python using Flask. It provides REST endpoints for authentication, route prediction, SOS alerts, hazard reporting, chatbot queries and administration. Pages are generated with Jinja2 templates, and data is exchanged in JSON and form formats.

E. Emergency SOS Dispatch

The SOS panel lets the user enter a trusted contact's email, a custom message and an optional voice message recorded with the browser's Media Recorder API and saved in WebM format. The Flask server sends the alert with Python's smtplib using Gmail's SMTP service with TLS. The email contains a Google Maps link to the reported location and the voice recording is attached. In the current prototype, the alert carries a fixed demonstration coordinate and integration of the browser Geolocation API for live positioning is planned. The device's Vibration API provides haptic feedback when emergency mode begins. An emergency contacts panel provides one-tap calling for the national numbers (ambulance 108, police control room 100 and national emergency 112). Users can also add personal contacts, each with a call link and a WhatsApp click-to-chat link that carries a pre-filled emergency message.

F. Automated Safety Monitor

When a trip starts, a Guardian Mode overlay informs the user that the trip is being monitored. During the trip, the system regularly displays an "Are You Safe?" prompt with a 30-second

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countdown. The user can confirm "I'm Safe" to resume monitoring or select "I Need Help" to send the alert immediately. If there is no response before the countdown ends, the system automatically sends the SOS. This is implemented in JavaScript with timers and event handlers, and the trip movement is simulated in the prototype. When the destination is reached, a "Journey Completed" screen is shown.

G. Community Hazard Reporting

Users report road hazards such as roadblocks or flooding by tapping the map to position the hazard and entering a description and optionally uploading a photograph. The data is sent to the server with the JavaScript Form Data API. Images are saved with unique filenames and each report is shown to other users as a map marker with the description, the reporter's name and the photograph and is also listed for administrators, so that warnings are shared around the community.

H. Assistant Chatbot

A floating chatbot widget provides weather-related and safety-related assistance. Messages are sent to a Flask endpoint, where keyword and regular-expression matching identifies the intent and extracts time references (e.g., "weather in 3 days") to produce context-aware replies. For safe-route queries, the chatbot directs the user to the route planner. The weather responses are currently simulated and integration with a live weather service is planned.

I. Authentication and Administration

Session-based authentication separates passenger and administrator roles, and user records are stored in JSON files. A history page lists past trips with date, source, destination, travel mode, time of day, route type and safety score, whereas in the current prototype this module is using sample data to demonstrate the feature. The administrator dashboard lists active SOS alerts with time, location, recipient and message, the community-reported hazards with image evidence, the trip history and the interface for configuring the email sender used for alerts.

J. Prototype Scope

The current prototype has simulated trip movement, a fixed demonstration coordinate for SOS alerts, in-memory storage for alerts and hazard reports, sample data for trip history and simulated weather replies. Live GPS positioning, route-deviation detection, a persistent database and a live weather service are planned as future work.

RESULTS AND DISCUSSION:

The implementation of GuardPath AI resulted in a web-based travel safety application that provided route recommendation and safety assessment, journey monitoring and emergency assistance, hazard reporting, and trip history. The system was tested for the main features to confirm that the proposed features would operate as one application. The acquired results are discussed below.

A. Route Recommendation and Safety Assessment

The developed system accepted the user's initial point and destination using the Plan Trip interface. Based on the journey details that the user provided, the system processed the available route information using the AI-based assessment to determine the safety level of the available travel option. The resulting route and its safety information were presented to the user.

This result showed that the system did not focus on obtaining the most efficient route to the destination. The safety information was inserted into the route-planning process, allowing the user to obtain the safety level of the recommended journey prior to initiating the trip.

B. Safety Score Generation

The system provided a safety score alongside the recommended route. The

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score was a straightforward method for the user to interpret the predicted safety condition of the route without having to comprehend the technical knowledge of the AI model.

The safety score also increased the transparency of the recommendation since the user simultaneously obtained the route information and its indication of the safety level. It made the route-selection process more informative than a conventional navigation system that provided the distance or travel time.

C. Web Dashboard

A functional web dashboard was developed to consolidate the major safety features as a unified interface. The dashboard granted access to the route planning, safety information, Guardian Mode, SOS assistance, hazard reporting, and trip history.

The integration of these components showed that the proposed system could provide support at the different stages of a journey. While the route planning and emergency assistance were typically treated as completely separate functions, GuardPath AI provided these functions through one web-based platform.

D. Guardian Mode

Guardian Mode was successfully integrated into the system to provide additional support after the journey had been initiated. The module maintained the status of the trip and identified conditions such as normal travel, delay, and off-route movement.

This result showed that the system exceeded the pre-trip route selection. While the safety assessment helped the user before travelling, Guardian Mode provided an additional monitoring layer during the journey, making the system suitable for situations where the journey status needed to be observed after route selection.

E. SOS Emergency Assistance

The SOS module was implemented and integrated with the dashboard. The user could access the dedicated interface when emergency assistance was required.

The inclusion of SOS within the same platform yielded a direct emergency-support option, eliminating the need for the user to exit the travel safety application. The system therefore combined the preventive safety measures, such as safer route selection, with an emergency-support mechanism.

F. Hazard Reporting

One of the additional features of GuardPath AI was the user-based hazard reporting. When the user encountered a blocked road, the user could report the problem and upload an image representing the situation. This feature provided a means of the user to communicate the changing road conditions to the other users. As an example, when a specific road was blocked, the reported information provided the other users with the opportunity to avoid that route. The system therefore introduced a collaborative safety component, in which the users could contribute useful information to enhance travel awareness.

G. Trip History

The system also maintained the information of the completed or planned trips, including the starting location, destination, recommended route, and safety score. The Trip History feature enabled the user to review their previous travel information via the application.

It provided a useful record of the earlier journeys and a foundation for future improvements, such as personalised travel analysis, repeated-route comparison, and better safety recommendations derived from historical user activity.

H. Overall System Integration

The major components of GuardPath AI were integrated into a common web application. The overall operation connected the user input, AI-based safety assessment, route recommendation,

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Guardian Mode, SOS assistance, hazard reporting, and trip history.

The integration result showed that the individual components could operate as parts of a singular travel safety system rather than as isolated functions. The system therefore provided the safety-related assistance prior to and during travel while also allowing the users to report hazards and review previous trips.

I. Discussion

The results showed that GuardPath AI provided a broader safety-oriented approach to travel planning. While the conventional navigation system typically focused on parameters such as distance and travel time, the proposed system incorporated the safety assessment into the route-planning process and supplemented it with additional journey-support features.

The combination of the safer route recommendation, Guardian Mode, SOS assistance, and hazard reporting was particularly useful considering that the travel safety could change during a journey. While the route that looked suitable during the planning could later be impacted by a road blockage, the reporting feature provided a means for users to communicate such changes. Meanwhile, the Guardian Mode and SOS provided additional support during the journey.

However, the effectiveness of the system relied on the quality and availability of the safety-related data that the AI component employed. Similarly, the user-submitted hazard information had to be validated to ensure its reliability. These limitations provided opportunities for future development, including larger and more diverse datasets, improved AI prediction, and stronger validation of the user-generated reports.

Overall, the implementation showed the feasibility of GuardPath AI as an integrated travel safety platform. The developed system successfully combined the AI-based safety assessment with route planning, journey monitoring and emergency assistance, hazard reporting, and trip history through a unified web interface. The results provided a foundation for future development of an adaptive, comprehensive travel safety solution.

CONCLUSION:

GuardPath AI was designed as an innovative route planning system that considers both safety and guidance aspects for the traveller. It is essential to note that the application goes beyond the basic route planning needs by introducing additional safety-centric features to the system.

The final solution was built upon the AI-based safety prediction model and a web interface for displaying and managing recommended routes. The Guardian Mode offers journey tracking assistance, whereas the SOS feature was added to request emergency aid. The travel history feature was also considered beneficial for the end-users. Additionally, a hazard reporting tool was introduced that allows users to submit blocked road reports with images so that the solution can avoid areas with issues. Therefore, the developed prototype presents a novel approach to combining the navigation and personal safety features in one system.

The application prototype was created to address the growing need for comprehensive tools for secure and convenient travel. The developed solution was built upon an AI-based safety prediction model that was trained on a collected dataset. It can be noted that the final product successfully addressed the initial requirements and introduced several beneficial modifications. In the future, it would be interesting to expand the solution's capabilities by implementing it on a larger scale and including more real-world data in the system, such as traffic and crime information. The addition of location tracking services and voice assistant features could also be considered to enhance the user experience and improve the performance of the application.

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FUTURE WORK:

The future development of the product will be channelled into making the system more reliable, practical, and effective. First of all, real-time GPS tracking and location data should be added to the system so that it can constantly monitor the user's location and detect any irregularities or deviations. The system's safety algorithm can be enhanced with additional data about the prevailing traffic, weather, road lighting, crowds, and other conditions that may affect the safety of a person. This way, the safety level and score will change depending on the specific circumstances. In addition, the machine learning part of the system can be improved by adding more data to the system in order to get more accurate results and prevent false alarms.

Another feature that could be added is a mobile application version of the system so that people could use it while being on the road. The system could use voice guidance so that a person would not have to look at the screen. Also, building a community around the product and encouraging people to report dangerous places and events based on their observations or GPS tracking data would enrich the database and safety score system. The application could notify users about the nearest hospitals, police stations, and other safe places in case of an emergency. The Guardian Mode feature could benefit from being able to differentiate between regular deviations and suspicious ones to avoid false claims and unnecessary panic. Finally, if a user does not respond to a Guardian Mode request, the system could be designed to share the person's location with their emergency contacts.

Another upgrade that could be considered is making the system more personalised so that users could set the safety conditions according to their preferences and needs. The system should also be compatible with other gadgets, such as smartwatches, to make sending out an SOS easier and more accessible. Furthermore, the tool would be much more attractive and useful worldwide if a version could be developed that works offline and in different languages. Finally, a series of tests with a larger sample of data and people can prove the accuracy, effectiveness, ease of use, and speed of the system. This will allow the product to evolve from just a simple proof of concept to a more sophisticated artificial intelligence system that will be able to provide better customer relations and safety for everybody who uses it.

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