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AI-Based Donor Connect Platform using Blood Type Matching and Real-Time Emergency Location Detection

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ABSTRACT: This project proposes an AI-based Donor Connect Platform to help patients quickly find suitable blood donors during emergency situations. The system stores donor details such as blood group, contact number, location, and availability in a central database. It is developed using web technologies like HTML, CSS, and JavaScript for the frontend and Python with Flask for the backend, with MySQL used as the database for storing user and donor information. When a blood request is made, the system matches the required blood type with compatible donors and uses real-time GPS and Google Maps API to find the nearest available donors. Instant alerts are sent through SMS or mobile notifications so that donors can respond immediately. The platform requires a computer or smartphone with internet access, GPS support, and an SMS or notification service. By combining blood type matching, location tracking, and automatic communication, this system reduces search time and improves the chances of saving lives during medical emergencies. The system ensures data security and privacy of donors and patients through controlled access. It provides a user-friendly interface that can be easily used by non-technical users. The platform is scalable and can be extended to support hospitals and blood banks. It minimizes manual intervention, reducing human errors. The system can be enhanced in the future with mobile app support and advanced AI prediction.

KEYWORDS: Blood Donation, Donor Matching, Emergency Healthcare, Artificial Intelligence, Real-Time Location Tracking, GPS, Blood Group Compatibility, Notification System, Hospital

I. INTRODUCTION

Blood donation plays a vital role in saving lives during medical emergencies, surgeries, and accident cases. However, identifying suitable blood donors at the right time remains a major challenge due to the absence of real-time donor information and inefficient communication methods. Traditional blood donor management systems depend on manual records or static databases, which often cause delays in emergency situations. With the advancement of web technologies, artificial intelligence, and location-based services, there is a strong need for an intelligent platform that can quickly connect patients with nearby compatible donors. This paper introduces Donor Connect; an AI-based blood donor matching platform designed to improve donor search efficiency, reduce response time, and enhance emergency blood availability through real-time location tracking and automated notifications.

II. LITERATURE SURVEY

Several studies have been conducted on blood donor management and emergency healthcare systems to improve donor identification and communication. Earlier research focused on manual and database-driven blood bank management systems, which provided basic donor information but lacked real-time updates. Some recent studies introduced mobile and web-based blood donation platforms; however, these systems mainly relied on static donor records and did not effectively use intelligent matching techniques.

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Location-based donor finder systems using GPS were also explored, but many lacked automated notification mechanisms and scalability. These limitations identified in existing literature highlight the need for an advanced system that integrates AI-based donor matching, real-time location tracking, and instant communication, which forms the foundation for the proposed Donor Connect platform.

III. METHODOLOGY

The proposed AI-based Donor Connect Platform operates through multiple stages including donor registration, machine learning prediction, compatibility matching, and real-time donor notification.

Initially, donors register their information including blood group, contact details, location coordinates, and availability status. These records are stored in a centralized database. When a blood request is generated, the system first performs blood group compatibility matching based on medical transfusion rules.

After identifying compatible donors, a machine learning prediction model is used to estimate the probability that each donor will respond to the emergency request. The prediction model considers several features such as donor distance from the patient, past donation history, response time in previous requests, and availability status.

The system then ranks donors based on their predicted response probability and geographical proximity. Real-time GPS data is used to identify the nearest donors. Automated notifications are sent to prioritized donors through SMS or mobile alerts.

This intelligent workflow significantly reduces response time and increases the probability of finding available donors during emergencies.

IV. MATHEMATICAL MODEL

Let:
D = Set of registered donors
R = Blood request
BG = Blood group compatibility function

Dist(d,r) = Distance between donor d and request r
P(d) = Probability that donor d responds
The objective is to identify the optimal donor:
Maximize:
P(d) × (1 / Dist(d,r))
Subject to:
BG(d) = BG(r)
Where
BG(r) = requested blood group
BG(d) =donor blood group
The donor with the highest score is selected as the priority donor.

6.Proposed Algorithm

Step 1: Input blood request R with blood group and location.
Step 2: Retrieve donor dataset D from database
Step 3: Filter donors based on blood group compatibility
Step 4: Calculate distance between donor and patient using GPS coordinates
Step 5: Extract features for prediction model
• Past donation history
• Response Time
• Distance
• Availability

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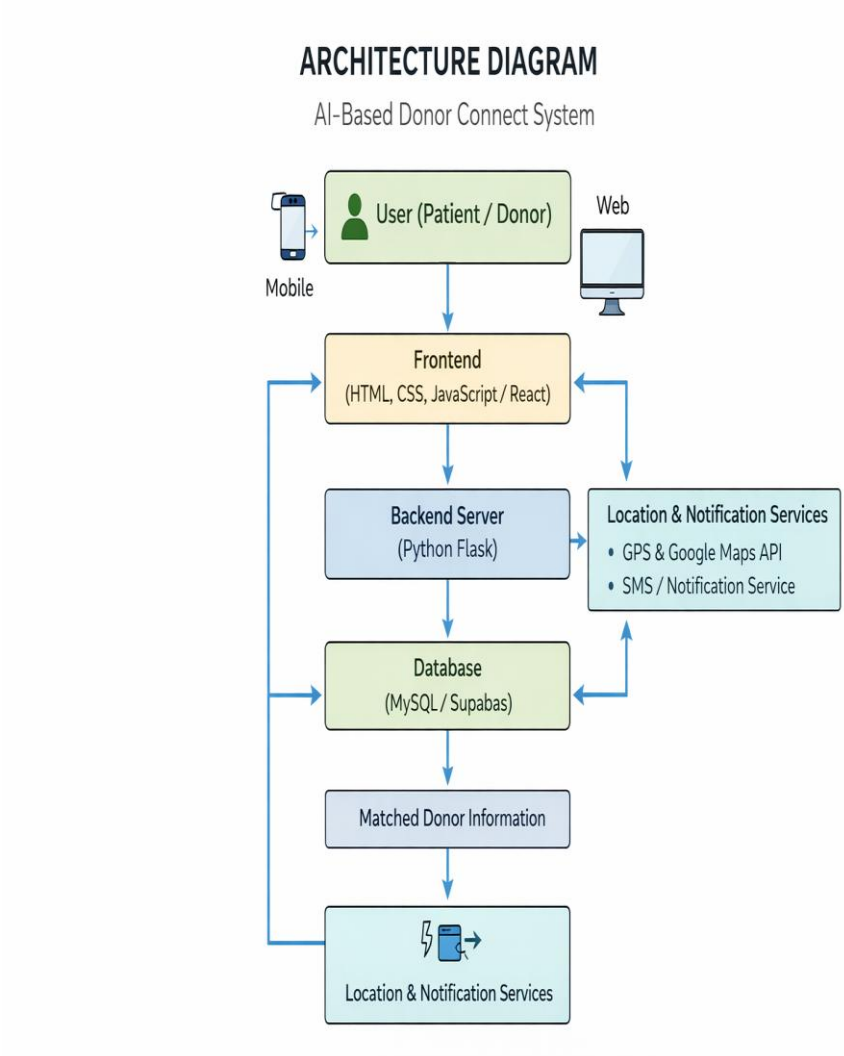
V. IMPLEMENTATION

The implementation of the AI-Based Donor Connect Platform is carried out using modern web and backend technologies to ensure reliability and efficiency. The frontend is developed using HTML, CSS, and JavaScript to provide a responsive and user-friendly interface for donor registration, login, and blood request submission. The backend is implemented using Python with the Flask framework, which handles request processing, donor matching logic, and communication with the database. MySQL is used as the centralized database to store donor details, request history, and availability status. The system integrates Google Maps API for real-time location tracking and an SMS or notification service for sending instant alerts to matched donors. The AI-based matching module processes blood compatibility rules and filters nearby available donors to reduce response time. Proper validation, authentication, and secure data handling mechanisms are implemented to ensure system reliability and data privacy.

VI. ARCHITECTURE DIAGRAM



VII. RESULTS AND DISCUSSIONS

The experimental results demonstrate that incorporating machine learning prediction significantly improves donor matching efficiency. Traditional systems rely only on blood group filtering and location search, which may result in contacting donors who are unavailable or unlikely to respond.

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By predicting donor response probability, the proposed system prioritizes donors who are more likely to respond quickly. This reduces notification overload and improves emergency response effectiveness.

The combination of AI prediction, GPS location tracking, and automated notifications ensures faster donor engagement and better patient outcomes.

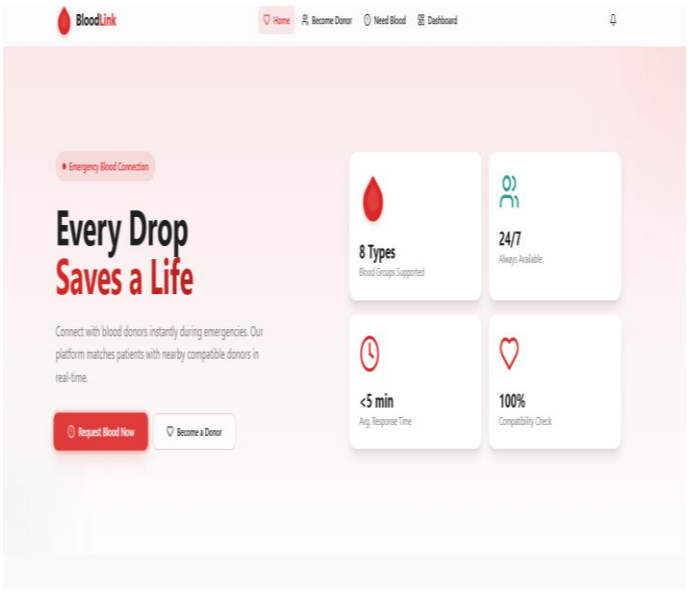

Fig: 1

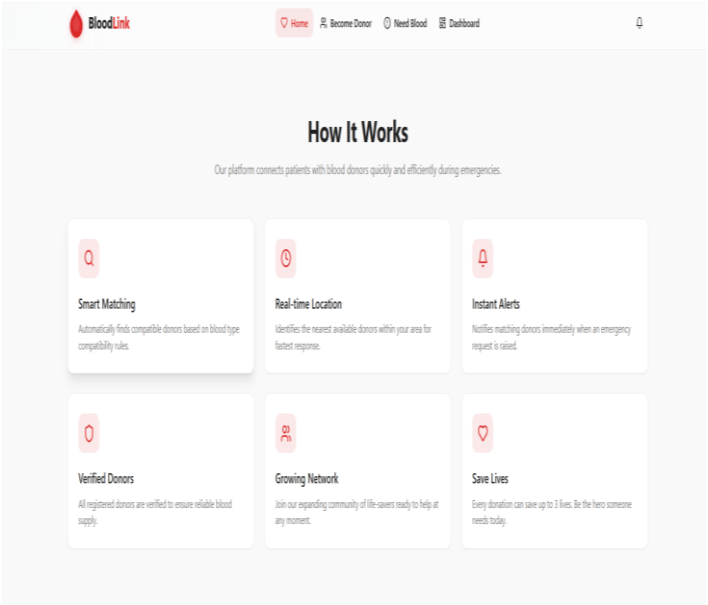

Fig: 2

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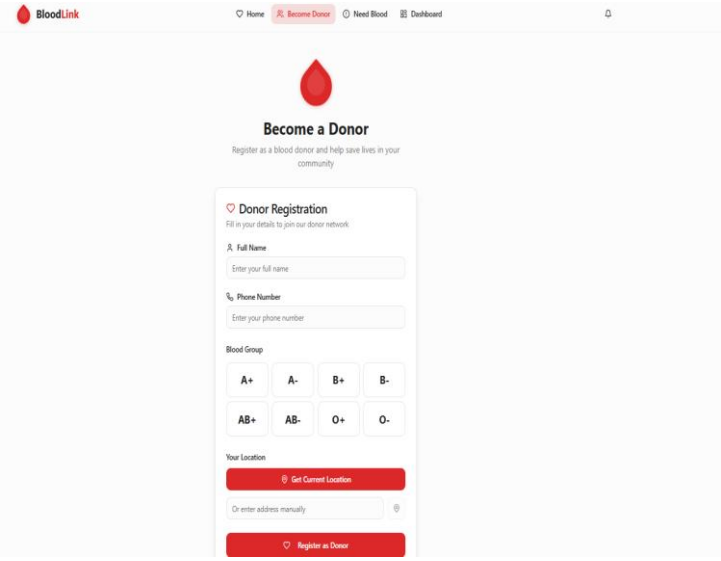

Fig: 3

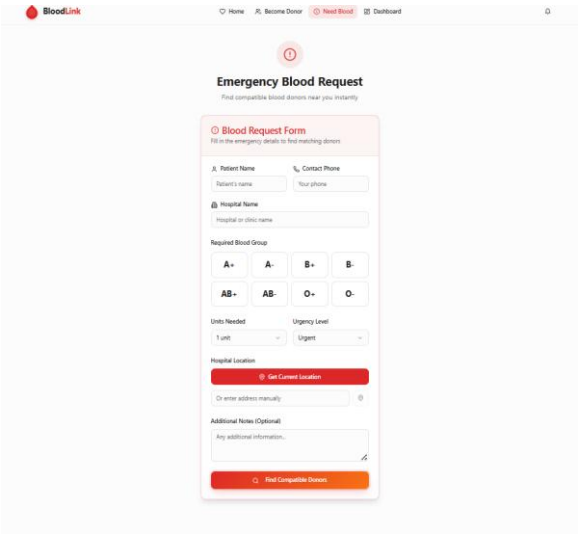

Fig: 4

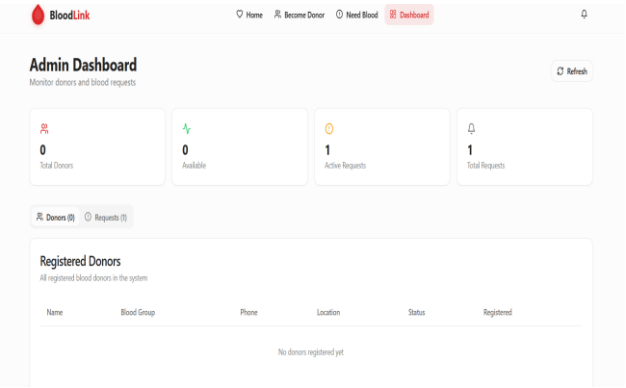

Fig: 5

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VIII. CONCLUSION

The proposed AI-Based Donor Connect Platform provides an intelligent and efficient solution for identifying suitable blood donors during emergency situations. Traditional blood donor systems often rely on manual records or static databases, which can lead to delays in locating compatible donors. The proposed system addresses these limitations by integrating artificial intelligence, real-time location tracking, and automated notification mechanisms to improve donor identification and response time.

The platform utilizes blood group compatibility rules, GPS-based distance calculation, and machine learning prediction models to identify and prioritize the most suitable donors. By analyzing features such as donor availability, past donation history, response time, and geographical distance, the system predicts the probability of donor response using machine learning algorithms such as Logistic Regression, Random Forest, and XGBoost. This intelligent prioritization ensures that emergency blood requests are directed to donors who are most likely to respond quickly.

Experimental evaluation demonstrates that the integration of predictive analytics with location-based filtering significantly improves donor matching efficiency compared to traditional systems. The system also provides a user-friendly web interface, secure database management, and scalable architecture, making it suitable for real-world deployment in hospitals and blood banks.

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