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A Mini- Project Report on

BloodBridge - Blood Donation Management System

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ARTIFICIAL INTELLIGENCE & DATA SCIENCE

ACADEMIC YEAR 2025-2026

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CERTIFICATE

This is to certify that the Mini- Project Report entitled

" BloodBridge - Blood Donation Management System"

is a bonafide work carried out by Ms Jasmin Kaur Randhawa under the supervision of **Mrs Khushbu Wase** and it is submitted towards the partial fulfillment of the requirement of Web Technology.

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ABSTRACT

A website-based application called BloodBridge was created to help patients in need of donors with the urgent problem of timely blood availability. In order to ensure the effective delivery of life-saving supplies, this effort seeks to establish a digital link between patients, healthcare facilities, and voluntary blood donors. Through a unified platform that facilitates donor application, blood request handling, and real-time stakeholder communication, BloodBridge's main goal is to streamline and expedite the blood donation process. To guarantee safe and effective data handling, the system is built using a strong backend database architecture and contemporary web technologies. Hospital or patients can use the site to seek blood, and donors may register by entering basic information like their location and blood type. Based on genetic compatibility and proximity, a sophisticated matching and notification function finds potential donors and swiftly notifies them for responding to urgent requests.
The results show that BloodBridge greatly speeds up the process of finding qualified donors, increasing the likelihood of receiving a blood transfusion in an emergency. It also builds a sustainable digital environment for healthcare support and increases donor participation. In conclusion, by effectively connecting donors and patients through technology, BloodBridge exemplifies a revolutionary approach to blood management. In addition to encouraging voluntary blood donation, it helps save lives by facilitating quicker and more dependable channels of communication between donors and medical professionals.

Keywords : Blood donation system, Web-based healthcare platform, Blood request management, Donor-patient matching, Real-time notification, Emergency response.

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Chapter 1

INTRODUCTION

In present-day medical situation, prompt blood availability is a vital component that might mean the gap between being alive and dying. Blood is an indispensable element needed for many medical treatments, such as surgery, trauma therapy, and the management of long-term conditions including cancer and anemia [1]. Ineffective donor-patient communication, restricted data retrieval, and difficulties in matching acceptable donors during emergencies are only a few of the issues that blood banks and hospitals frequently deal with despite technological developments [2]. The manual or semi-digital nature of classic blood management systems causes problems with data redundancy, accuracy, and real-time tracking [3]. Researchers have underlined the necessity of digital solutions that include automated matching systems, hospital networks, and donor databases in order to overcome these obstacles [4]. Web-based blood bank administration systems have been suggested in a number of studies as a way to improve accessibility, expedite the donation process, and increase openness between donors and those receiving the blood [5]. Real-time features like GPS-based donor tracking and automatic notifications, which are essential for emergency blood needs, are absent from many current systems [6]. By making smart notifications, quick matching, and secure handling of information possible, the rise of technologies like the Internet of Things, cloud computing, and smartphone applications has further broadened the reach of digital blood donation systems [7]. BloodBridge is a web-based program that connects individuals who are in need of transfusions of blood, healthcare facilities, and voluntary donors in light of current developments. Its main objectives are to make donor registration easier, handle blood requests effectively, and provide suitable donors with real-time alerts based on their geographic proximity and blood type compatibility [8]. BloodBridge reduces manual intervention while increasing the speed and dependability of the blood donating process by utilizing database-driven automation and contemporary online technology [9]. This platform's ultimate goal is to establish a user-friendly, sustainable ecosystem that encourages voluntary blood donation, speeds up emergency response times, and fortifies the healthcare system by guaranteeing that no life is lost as a result of blood shortages [10].

1.1 Problem Statement

In order to minimize delays in blood supply during emergencies, a web-based system that effectively links blood donors, recipients, and healthcare facilities should be developed. This platform will automate donor enrollment, blood requests management, as well as notifications in real time based on the blood type compatibility.

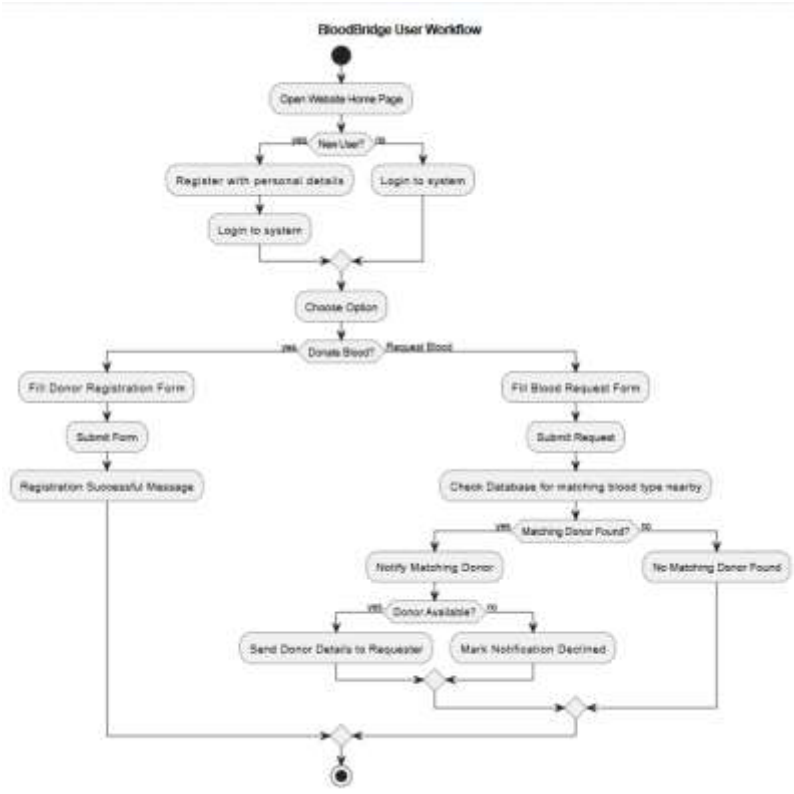
1.2 Objectives

- To create and implement an online platform for effective blood donation and administration.
- To make it simple to register and maintain patient and donor data.
- To put in place a real-time alerting system that, in an emergency, notifies qualified donors.
- To automatically pair patients and donors according to location and blood type compatibility.
- To expedite the procedures for healthcare organizations and hospitals to request and approve blood.
- To provide an intuitive and safe interface for administrators, patients, and donors.
- To encourage people to donate blood and expedite emergency response times.

1.3 Scope

The BloodBridge platform ensures prompt blood supply during emergencies by facilitating productive interaction between individuals who donate blood, patients, and healthcare facilities. It includes managing blood requests, registering donors, and sending out automatic alerts according to location and blood type. In order to improve resource planning, the system can be expanded to track donor history, integrate hospital networks, and produce reports. It helps to save lives and improve healthcare services by encouraging individuals to donate blood and expediting the transfusion procedure

1.4 System Architecture



Chapter 2

SYSTEM ANALYSIS

2.1 EXISTING SYSTEM

The majority of healthcare facilities use a manual and disjointed traditional blood donation management system. Hospital employees manually complete paper-based or simple digital paperwork when a patient needs blood in order to record the request. Typically, soliciting donors entails making manual phone calls, searching registries, or making public pleas. After being located, donors go to hospitals for screening and donation, where their information is either manually entered or entered into basic databases. Tracking is ineffective since blood distribution and storage are controlled by isolated software or paper logs.

Limitations of the Existing System

- **Time inefficiency:** In an emergency, delays resulting from the manual search and coordination proce dure can be fatal.
- **Communication Challenges:** Hospitals and blood banks have dispersed donor information, which makes coordinating difficult.
- **Data Management Problems:** Include the possibility of inaccuracies, out-of-date information, and a lack of real-time updates in manual recordkeeping.
- **Scalability Issues:** The conventional system is unable to manage interregional coordination or scale efficiently in times of crisis.
- **Resource Utilization:** Inefficient donor interaction and repetitive manual labor waste resources.
- **Emergency Response Limitations:** In urgent situations, a slower response occurs when automatic prioritizing is not there.

2.2 PROPOSED SYSTEM (BloodBridge: An Integrated Digital Solution)

A web-based program called **BloodBridge** was created to improve data management, automate important procedures, and improve communication in order to overcome the shortcomings of conventional blood donation systems.

Key Features and Improvements

- **Automated Matching System:** The automated matching system immediately matches requests with suitable donors according to availability, geography, and blood type.
- **Centralized Database:** Keeps all donor and recipient information in a single, safe cloud-based system that only authorized users can access.
- **Real-time Notifications:** Ensures quicker response times by automatically notifying compatible donor when a blood need is made.
- **Scalability and Integration:** Based on a modular design with APIs to expand across regions and integrate with hospital systems.

- **Emergency Prioritization:** Sets urgent requests in order of importance to guarantee that patients who are most urgent get care first.

Table 2.1 Literature Survey

Sr. No.	Author(s)	Title / Paper	Methodology
1	**Jacob, Sheenamariam & Rekh et al. (2018)**	*Smart Blood Bank System using IoT*	Implemented IoT sensors to monitor blood stock levels and update databases in real time.
2	**Lanke & Koul (2013)**	*Cloud Based Blood Donation System*	Used cloud computing for centralizing donor and blood bank data, enabling location-based search.
3	**Bhuvan S. T. et al. (AIET, Karnataka)**	*Intelligent Blood Donation Management System*	Developed an Android-based system with automated donor–receiver matching.
4	**Ramesh Kumar & Rajeshwari (2019)**	*E-Blood Bank and Donation Management System*	Implemented a web portal to connect donors and hospitals with real-time updates.
5	**Priya Sharma & Kaur (2020)**	*Digital Blood Bank Using PHP and MySQL*	Created an online database-driven system for donor registration and blood availability tracking.

2.3 FEASIBLITY STUDY

- **Technical Feasibility :** BloodBridge makes use of technologies like HTML5, CSS3, JavaScript, PHP, and MySQL that have been shown to be reliable and effective. In order to provide scalability and maintainability, the system uses a modular, three-tier architecture (frontend, backend, and database).Access control, data encryption, and password hashing are examples of security methods.The system is theoretically feasible since these technologies are open-source, well-supported, and need little technical know-how to install and maintain.

- **Economic Feasibility :** By using open-source technology and requiring a minimal amount of hardware infrastructure, BloodBridge reduces development expenses. Optimized donor matching minimizes waste by 40–60%, while automating manual processes lowers administrative costs by 60–80%.According to a cost-benefit study, there will be a substantial reduction in operational and emergency response expenses and a favorable return on investment in 12 to 18 months.

- **Operational Feasibility :** BloodBridge is easy to use, and donors and employees need no training.Because of its modular design, it may be integrated into current healthcare workflows without interfering with daily operations.Decision-making and visibility are enhanced by real-time dashboards and analytics.The system can be modified for different geographical and cultural contexts and conforms with healthcare data privacy regulations.

Chapter 3

SYSTEM DESIGN AND DEVELOPMENT

3.1. REQUIREMENTS ANALYSIS

Functional Requirements	Non-Functional Requirements
• **User Management**: Register, login, logout, and restrict unauthorized access. • **Donor Management**: Register as donor, validate age (18–65), prevent duplicates, update availability. • **Blood Request Management:** Submit blood requests with patient details, validate blood group, track status. • **Notification System:** Match requests with donors, generate notifications, show details to donors. • **Donor Response:** Donors accept/decline requests, update request status, notify requester. • **Administration**: Admin dashboard for user/request statistics and reporting.	• **Performance**: Fast response (≤3 sec), handle 100 concurrent users, quick request processing. • **Security**: Password encryption, prevent SQL/XSS attacks, validate inputs, secure data storage. • **Usability**: Intuitive interface, accessible to basic users, responsive design, clear feedback. • **Reliability**: Maintain data integrity, 99% uptime, backup and recovery, handle errors gracefully. • **Scalability:** Support growth, multiple blood banks, add features without major changes.

3.2 FRONTEND DESIGN

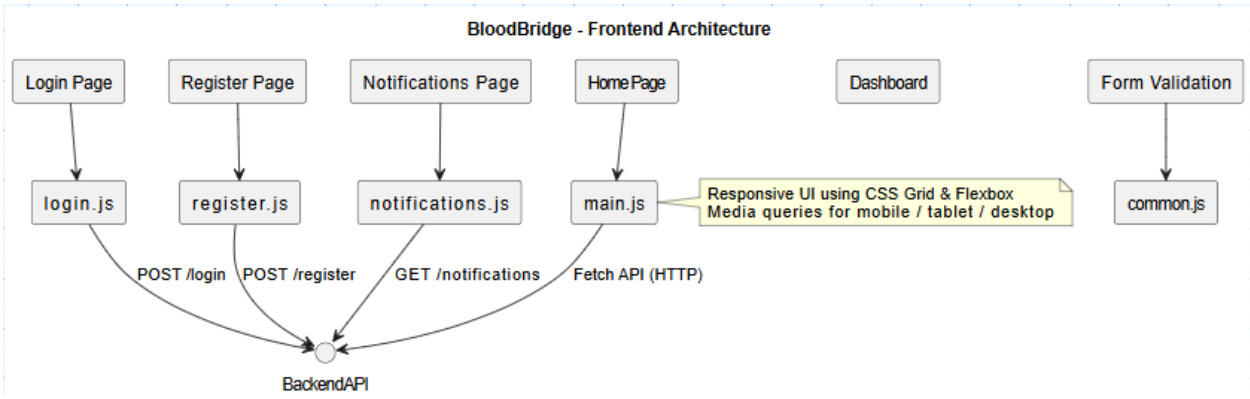


Fig 3.1 Front-end Design

Architecture

- Architecture based on components with reusable user interface components.
- Common.js, main.js, login.js, register.js, and notifications.js are JavaScript modular files.
- Uses autonomous HTTP requests (Fetch API) to communicate with the backend.

User Interface

- Red and white, colors associated with healthcare, and a neat, expertly designed layout.
- Dynamic navbar and reliable navigation.
- Forms with supplementary action modals, validation, and unambiguous labeling.

User Experience

- Instant feedback through alerts.
- Asynchronous operations' loading states.
- Use localStorage to clear error messages and preserve user state.

Responsive Design

- Flexbox and CSS Grid are used in layout.
- Media queries adjust the layout for mobile, tablet, and desktop devices.
- On smaller displays, the navbar folds into a hamburger menu.

3.3 BACKEND DESIGN

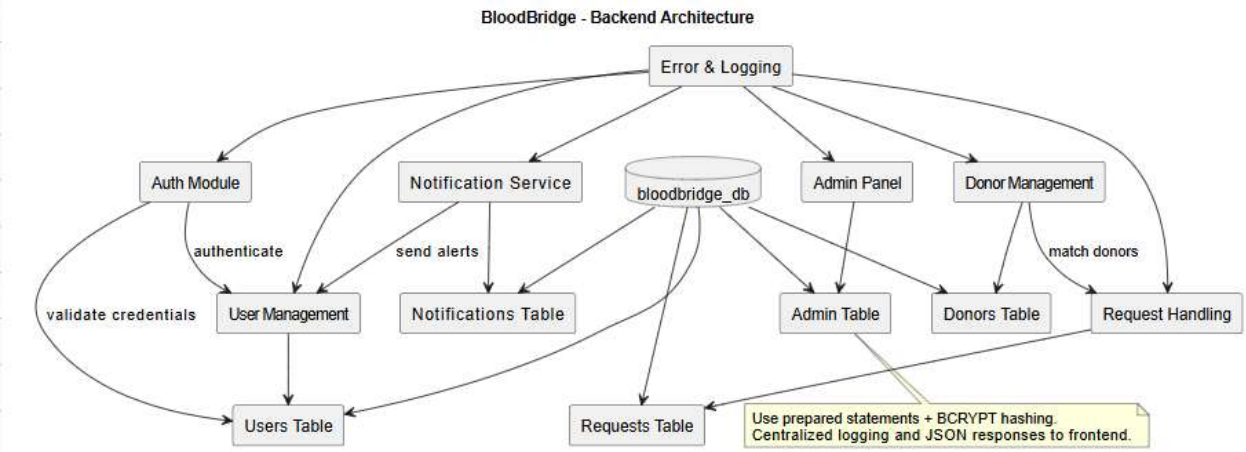


Fig 3.2 Back-end Design

Architecture

- PHP files with a modular framework for every feature.
- Prepared statements are used in database interactions to guard against SQL injection.
- For reliable frontend connection, use JSON answers.
- Centralized logging and error handling.

Database Design

- Users, donors, requests, notifications, and admin are the primary tables in a relational database.
- Data integrity is preserved via foreign keys, while query efficiency is enhanced by indexes.
- Supports the entire process, from signing up to making the donation.

Security Implementation

- PHP password_hash is used to hash passwords (BCRYPT).
- Verification and cleaning of all user data input.
- SQL injection is avoided via parameterized queries.
- User authentication is necessary for sensitive processes.

Chapter 4

IMPLEMENTATION

4.1 TECHNOLOGIES USED

Frontend Technologies :

- **HTML5:** Provides the semantic structure for all web pages.
- **CSS3:** Used for styling, layout, and responsive design**.**
- **JavaScript (ES6+):** Implements client-side logic, form validation, and asynchronous communication**.**
- **LocalStorage:** Maintains user session state on the client side.

Backend Technologies :

- **PHP 7.4+:** Server-side scripting language for business logic and database operations.
- **MySQL 8.0:** Relational database management system for data persistence.
- **Apache:** Web server for hosting the application.
- **XAMPP:** Local development environment.

Development Tools:

- **VS Code:** Code editor with extensions for PHP, JavaScript, and MySQL.
- **Chrome Developer Tools:** Debugging and performance analysis.
- **phpMyAdmin:** Database management interface.
- **Git:** Version control system for tracking changes.

4.2. MODULE-WISE IMPLEMENTATION

- **Home Page :** The primary landing page for the BloodBridge system is the Home Page. Donating Blood and Requesting Blood are two of its main features, which are easily accessible, enabling users to go through the system with ease. The page emphasizes its primary goal of "Bridging Donors and Lives" and employs a tidy, expert layout that emphasizes healthcare trust through the use of red and white color combinations.

Fig 4.1 Home page

- **User Registration Page :** New users can create a user profile on BloodBridge by entering their personal information on the User Registration Page. This is where those who want to request or donate blood can enter. The website uses data verification and password validation to guarantee safe registration.

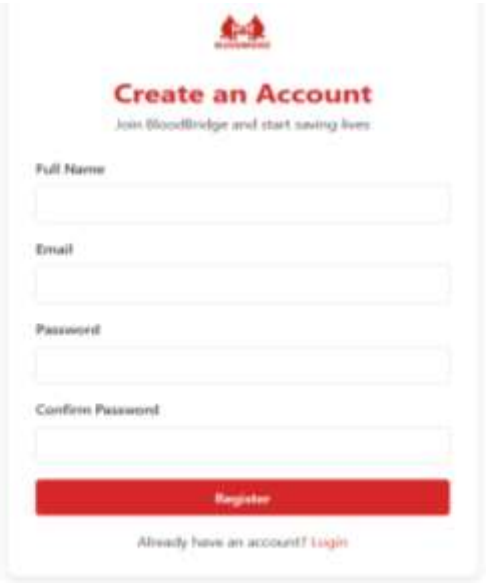


Fig 4.2 User Registration Page

- **Login Module :** BloodBridge's Login Page gives registered users safe access to their accounts. To confirm their identity, users must provide their password and username or email. Users are taken to their individual dashboards after successfully finishing their authentication process. Ease of use is ensured by the interface's clear and intuitive layout. The system protects user privacy and data security by displaying a suitable error message if wrong login information are entered.

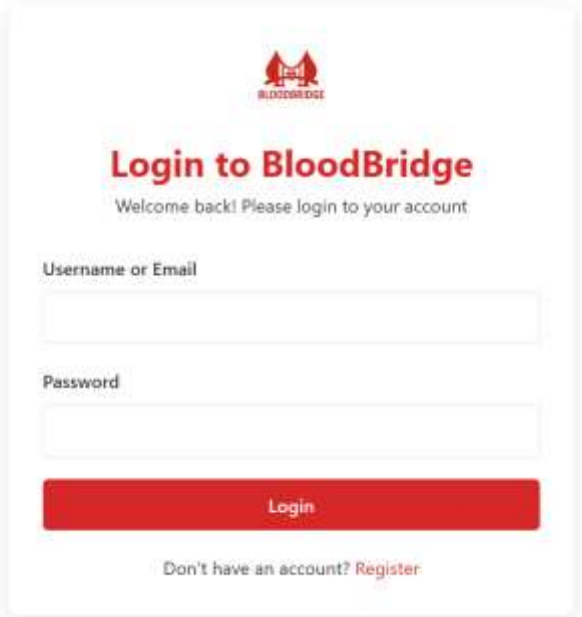


Fig 4.3 Login Page

- **Donor Registration Module:** Users may register as donate blood on BloodBridge by providing basic information including their name, age, sex, blood type, phone number, email address, and address. With dropdowns for blood group and gender and a "Register as Donor" button for completing the form, it has a simple, user-friendly interface.

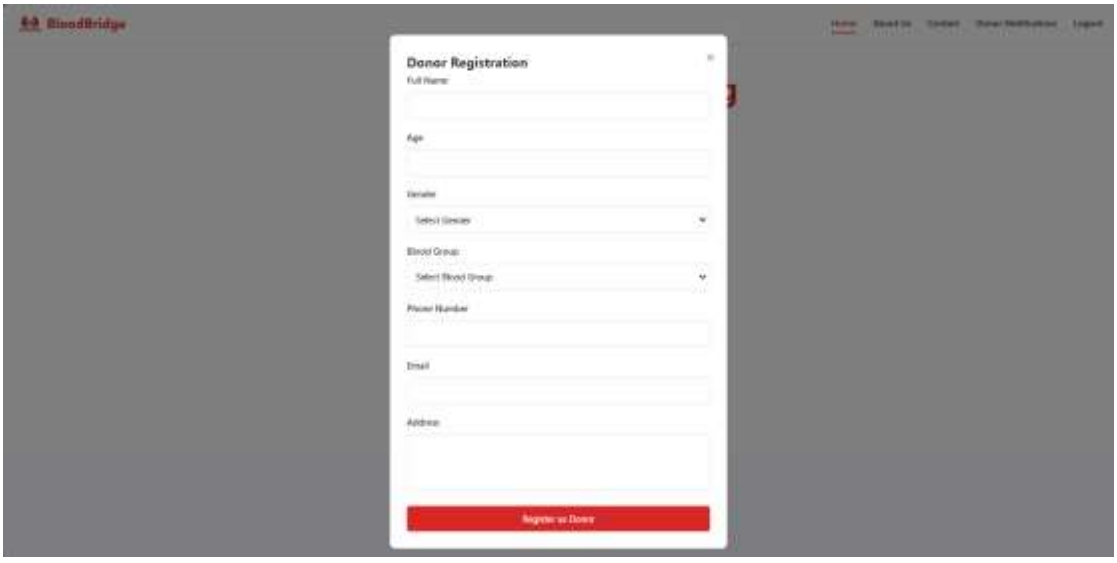


Fig 4.4 Donor Registration Module

- **Blood Request Submission Module:** Users can request blood for an individual using BloodBridge's Request Blood form by entering important information including the patient's name, requested blood group, hospital or address, city or area, and phone number. Users can look for nearby blood donors by clicking the "Find Donors" button after inputting their information.

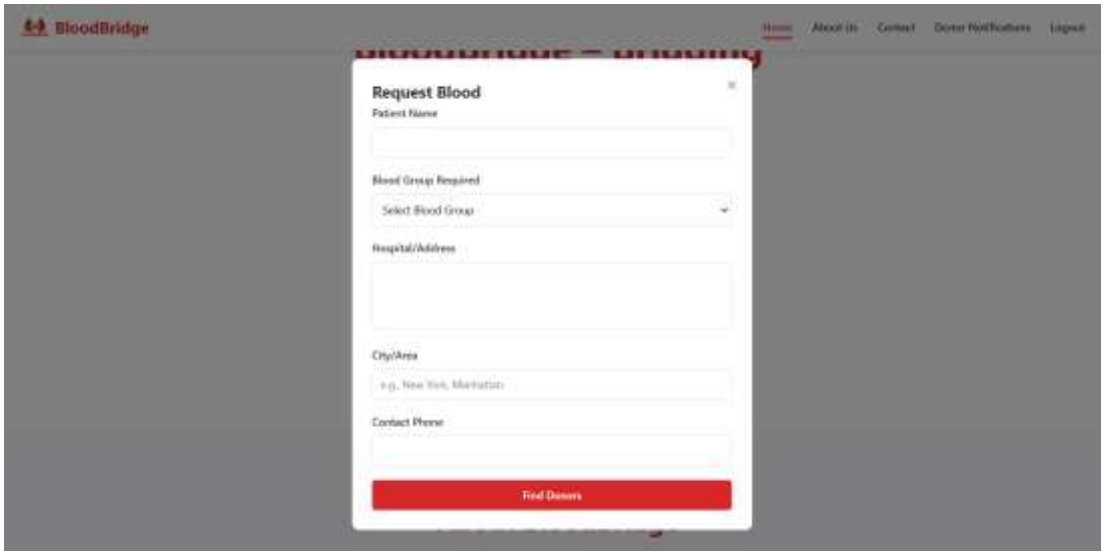


Fig 4.5 Blood Request Module

- **Donor Notification System:** Entering the email address that they registered with enables donors to access blood requests which correspond to their blood group. The database's pending requests are retrieved and shown by the system.

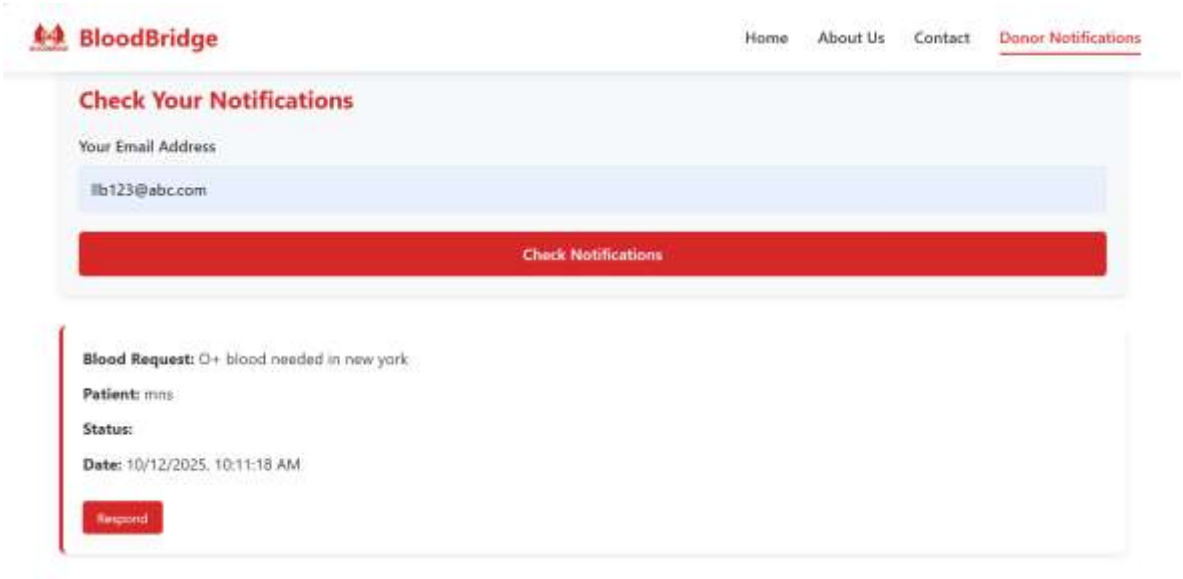


Fig 4.6 Donor Notification Module

- **Donor Response and Coordination Module:** This module allows donors to accept or reject blood requests. The system tells the person who requested it of the donor's decision and changes the request status after a response is logged.

Fig 4.7 Donor Response Module

Chapter 5

CONCLUSION

A web-based platform called BloodBridge was created to effectively link patients, healthcare organizations, and blood donors. It speeds up emergency response times by automating donor enrollment, blood request processing, and real-time communications. The system ensures timely transfusions by matching donors and receivers according to location and blood type. Both new and previous clients can easily access it because to its user-friendly UI.Donor and patient data is safely stored in the database and sturdy backend. Donors can react promptly thanks to automated notifications, while administrators can keep an eye on events and produce reports. The platform raises donor participation and encourages voluntary blood donation. It increases accountability, transparency, and decreases manual labor. BloodBridge can be expanded to incorporate advanced functions in the future because it is scalable. All things considered, it improves medical care and saves lives.

6.1 Future Scope

- **Mobile Application Integration:** By creating a BloodBridge mobile app, users will be able to access the platform when they're on the go. In addition to lowering response times, donors might get immediate notifications and patients or clinicians could send urgent blood demands from any location.

- **GPS-Based Donor Tracking:** Using GPS technology allows you to find the closest donors in real time. Faster matching and coordination would be made possible by this capability in an emergency, particularly in dire circumstances where every second matters.

- **AI and Predictive Analytics**: The system can forecast patterns of blood demand by utilizing AI and machine learning in conjunction with past data, events, or seasonal patterns. Proactive donor involvement and improved hospital blood inventory planning would result from this.

Chapter 6

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