A Project Report on

BLOOD DONATION MANAGEMENT SYSTEM

Submitted in the partial fulfillment for the award of degree for

Master of Computer Applications

Submitted By

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KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY (KIIT)

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May 2025

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CERTIFICATE FROM GUIDE

This is to certify that this project entitled "BLOOD DONATION MANAGEMENT SYSTEM" Submitted in partial fulfillment of the degree of MASTER IN COMPUTER APPLICATION (MCA) to the KIIT University, done by Mr. Saswat Ranjan Nayak, Roll No. 10634321, is an authentic work carried out by him under my guidance.

The matter embodied in this project work has not been submitted earlier for the award of any degree or diploma to the best of my knowledge and belief.

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DECLARATION

I, **Saswat Ranjan Nayak**, roll no **10634321** do hereby declare that the project report entitled **BLOOD DONATION MANAGEMENT SYSTEM** submitted to **School of Computer Applications, KIIT University, Bhubaneswar** for the award of the degree of **Master of Computer Applications (MCA) ,** do I carry out an authentic and original work solely from 15th March 2025 to 5 May 2025 at **School of Computer Applications, KIIT University .** ,

Saswat Ranjan Nayak.

Signature of the student
Date: 10 May 2025

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This satisfaction which accompanies the successful completion of any task is incomplete without the mention of those persons whose hands are behind the success. Because the success is the epitome of hard work, prevention, zeal, determination and the most encouraging guidance and advice serving as beacon of light and crowing our effort with success.

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ABSTRACT

The blood donation management system is a web application that allows users to manage blood donations and donors. The system is built using Node.Js, Express, and MongoDB, and uses CRUD (create, read, update, delete) operations to manage data.

The system includes the following features:

Authentication: Users can sign up and log in to the system using their email and password. The system uses decrypt for password hashing and JSON Web Tokens for authentication.

Donor management: Users can create, read, update, and delete donor records. Each donor record includes the donor's name, contact information, blood type, and donation history.

Donation management : Users can create ,read ,update, and delete donation records. Each donation record includes the donor's name, the date of the donation, and the amount of blood donated.

Search and filter: Users can search for donors and donations by name, blood type, or date.

Google OAuth2 authentication: Users can sign up and log in to the system using their Google account. The system is designed to be easy to use and maintain, and includes error handling and validation to ensure data integrity. The system can be deployed to a web server or cloud platform, and can be accessed from any device with an internet connection.

Overall, the blood donation management system is a powerful tool for managing blood donations and donors, and can help save lives by ensuring that blood is available when and where it is needed..

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CHAPTER-1
INTRODUCTION

The Blood Donation Management System is a crucial tool designed to streamline and enhance the efficiency of blood donation processes. This project focuses on leveraging CRUD operations (Create, Read, Update, Delete) to manage crucial data related to blood donors, recipients, inventory, and donation drives. With the increasing demand for safe and timely access to blood transfusions, especially in emergencies, the need for a robust system to manage blood donation activities becomes paramount.

The system aims to address key challenges faced by blood banks, hospitals, and donation centers, such as donor record management, inventory tracking, scheduling donation drives, and ensuring timely availability of blood units. By incorporating CRUD operations, the system enables users to seamlessly create, update, retrieve, and delete information, ensuring data accuracy and integrity throughout the process.

This report provides an in-depth analysis of the Blood Donation Management System, including its objectives, scope, methodology, architecture, features, and implementation details. It also discusses the benefits of adopting such a system, including improved efficiency, better resource utilization, enhanced donor engagement, and ultimately, saving more lives through efficient blood donation management

1.1 MOTIVATION AND OVERVIEW

The motivation behind developing a Blood Donation Management System using CRUD operations stems from the critical need for efficient and organized blood donation processes. Blood is a life-saving resource, often required in emergencies, surgeries, and medical treatments. However, managing blood donation activities manually can lead to inefficiencies, errors in data management, and challenges in maintaining an up-to-date inventory. The primary motivation for this project is to create a centralized platform that automates and streamlines blood donation operations. By leveraging CRUD operations, we aim to simplify data entry, retrieval, update, and deletion tasks, thereby improving the overall management of donor records, inventory levels, donation drives, and communication with stakeholders.

1.2 PURPOSE

The Online Blood Bank project aims to create a platform for managing and tracking blood donations, connecting donors with recipients, creating & managing blood donation camps and providing real-time information on blood shortages and needs.

1.3 SCOPE OF THE PROJECT

The scope of the project includes the development of a web-based platform for managing and tracking blood donations, connecting donors with recipients, and providing real-time information on blood shortages and needs. The platform will include both a user-facing interface and an blood bank's interface for managing the data.

1.4 KEY OBJECTIVES OF THE SYSTEM

- To create a user-friendly interface that allows administrators to manage blood inventory, donor data, and drive schedules efficiently.
- To ensure accuracy and transparency through real-time data updating and monitoring.
- To minimize human error and reduce the administrative burden through automation.
- To facilitate communication between stakeholders including donors, hospitals, and organizers of donation drives.
- To make the data easily accessible and securely stored using modern database techniques.

1.5 IMPORTANCE OF BLOOD DONATION MANAGEMENT

- Blood is a perishable resource with a limited shelf life, making inventory management both critical and challenging. A minor error in recording blood type, quantity, or expiration date can lead to severe medical mishaps. Therefore, the goal is to develop a system that not only maintains records but also provides alerts on low stock levels, upcoming expiration dates, and the need for specific blood types based on demand analysis.
- Additionally, this system emphasizes the importance of *data security and privacy*. Donor and patient records are sensitive and must be protected against unauthorized access. Implementing user authentication, role-based access control, and data encryption are some of the planned features to ensure data protection.

CHAPTER-2
LITERATURE REVIEW

2.1 INTRODUCTION

This section discusses findings and observations done by some research works on web-based blood bank management system. The gathered information on these related papers-strengthens and supports the research study.

2.2 LITERATURE STUDIES

According to 2Teena, C.A, Sankar, K. and Kannan, S. (2014) in their study entitled "A Study on Blood Bank Management", they defined Blood Bank Information System as an information management system that contributes to the management of donor records and blood bank. Their system allowed an authorized blood bank administrator to sign in with a password to manage easily the records of donors and patients who need blood. The system provided many features including the central database, quick access to the system content through the login, includes the search code to find donors on a given basis, and the ease of adding and updating donor data. The main aim of the system was to complete0the process of the blood bank. This system was designed to suit all types of blood banks. Once successful in the implementation of the application, it can be applied and rolled out in several blood banks. This application contains User Login Screen, Blood Management, Menu Form, Blood Stock, Donor Management, Donor Registration, Blood Reservation, Donor Blood Test, Recipient Management and Blood Reservation. In similar manner, the researchers planned in their application to have hospital administrator, doctors, and blood bank receptionists as users. The authors did not mentioned the research method they used, and failed to provide screenshots of the system prototypes, making difficult for the researchers to visualize their application. No discussion also for their respondents, samples and sampling techniques used. Subsequently, the researchers planned to provide figures to explain the system, screenshots of system prototypes, and other diagrams that can help other researchers to visualize the development of web- based blood bank management system. Also, the researchers will explicitly discuss its research methods,sampling procedures.

A study by Mahapatra, A. et al. (2016) highlighted the benefits of integrating mobile applications with cloud-based blood bank systems. Their proposed system allowed real-time access to blood stock data, donor eligibility information, and geolocation-based donor suggestions.

Similarly, Nisha et al. (2017) developed a decentralized architecture for blood donation systems, where hospitals and blood banks were treated as nodes in a peer-to-peer network. Their research addressed the challenges of data synchronization across multiple locations and proposed blockchain as a potential solution to maintain transparency and security. The system's audit trail ensured that records were immutable, which is essential when dealing with medical and personal data.

2.3 COMPARATIVE STUDIES OF EXISTING SYSTEMS

Many existing systems, both commercial and research-based, have similar functionalities such as donor registration, inventory monitoring, and drive management. However, they differ in terms of their scalability, user interface design, technology stack, and security protocols. A comparative study by Yadav and Gupta (2018) examined five different web-based blood bank management systems and evaluated them based on performance, security, and ease of use. Their findings concluded that while most systems met the basic requirements, few addressed advanced issues like donor health tracking, AI-based blood type predictions, and integration with national health databases.

2.4 GAPS IDENTIFIED IN LITERATURE

While many of the reviewed systems focused on streamlining core blood bank operations, several gaps remain. Firstly, user experience (UX) is often overlooked in these systems. Donors may be discouraged from participating due to complicated interfaces or a lack of mobile compatibility. Secondly, language support and accessibility are rarely addressed, which limits the reach of these systems in rural or non-English speaking regions. Additionally, donor motivation and retention features such as gamification, loyalty points, or social media integration were seldom implemented, despite their potential to boost participation.

However, there is still room for innovation—particularly in improving the user experience, enhancing accessibility, ensuring interoperability with other medical systems, and introducing advanced analytics. The proposed project builds upon these findings by aiming to fill these gaps and develop a modern, intuitive, and secure Blood Donation Management System that meets the needs of today's fast-paced healthcare environment.

CHAPTER 3
METHODS AND PROCEDURES

3.1 INTRODUCTION

This section presents the research methodology used in the study, the research design, and the data collection process. This section also presents the theoretical or conceptual framework of the study, the sampling plan, and tools to be used for data analysis.

3.2 THEORETICAL/ CONCEPTUAL FRAMEWORK

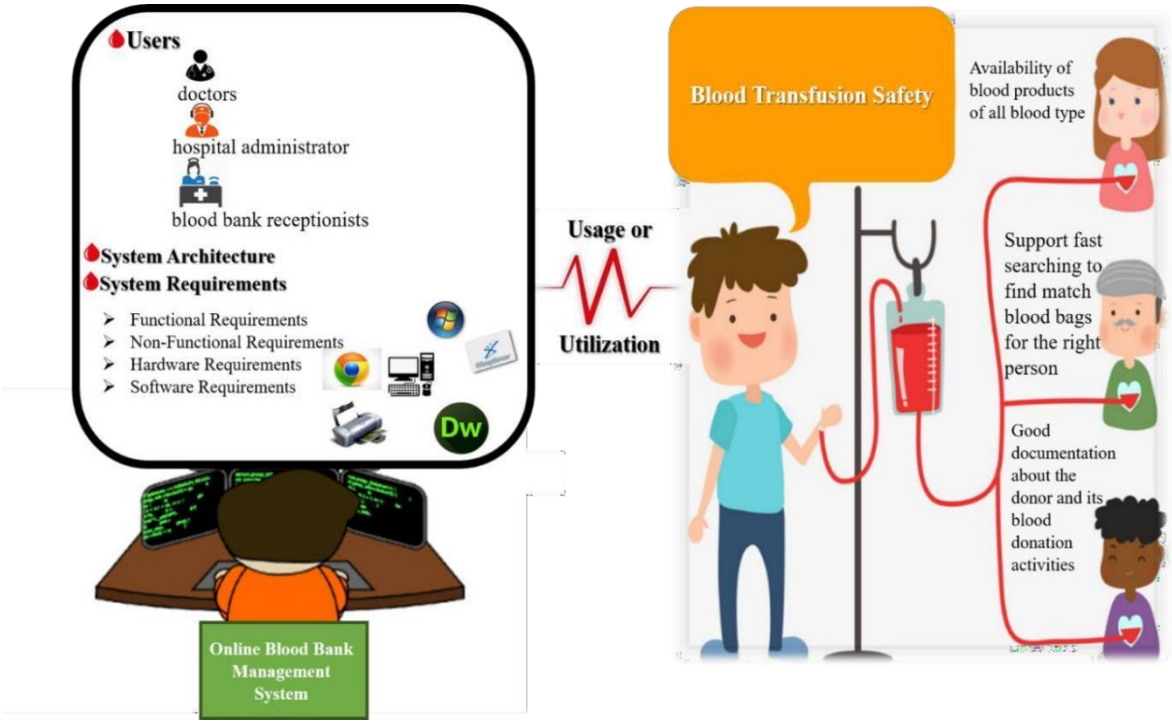


Figure 1: Conceptual Framework

The conceptual framework served a mental window of the researchers because it depicted the research design and the relationships of the variables involved. Based on the figure above, the usage or utilization of the online blood bank management system can lead to the enhancement or improvement of blood transfusion safety.

3.3 EXTERNAL INTERFACE REQUIREMENTS:-

USER INTERFACE:-

- User interface is designed in a user friendly manner and the user, in another end he has to give the order, for that he will interface with keyboard and mouse.

HARDWARE INTERFACE:-

- OS– windows7
  and above
- Hard disk – 80 GB (Min.)
- RAM – 4 GB
- Keyboard – Standard QWERTY keyboard for interface.

SOFTWARE INTERFACE:-

- Front end – HTML ,CSS ,Java Script, React.Js
- IDE – VS Code
- Backend – Mongodb, NodeJS, Express.Js

3.4 PERFORMANCE REQUIREMENTS:-

The capability of the computer depends on the performance of the software. The software can take any number of input provided the database size is large enough. This would depend on the available memory space.

3.4 ARCHITECTURE

ER DIAGRAM

A Blood Bank stores blood of various blood groups . Many donors donate blood ,each of different blood group/type. A donor may donate blood more than once and he is identified by a donor id(DID),name, sex, age, address and phone number. The blood donated by the donor is characterized by blood type , code and cost. Before each donor donates his blood , he is required to register himself as a donor with the receptionist who works at the Blood Bank. The receptionist is identified by employee id, name , address and phone number. The Blood Banks receives orders for blood from many hospitals for emergency purposes and other surgical requirements and each blood bank issues the same of required blood type. Each blood bank has it's own blood bank number(BNO) , issues, orders and blood types stored. The Blood Bank is managed by the blood bank manager who is identified by employee id , name , email_id and phone number .He is responsible for the proper management of the blood bank . The hospitals are identified by name, address and phone number. Represent this using an ER diagram.

Entities and Their Attributes

Donor:

- This entity represents individuals who donate blood.
- Attributes include Donor ID (DID), Name, Sex, Age, Address, and Phone Number.
- A donor can donate multiple times, and each donation is associated with specific blood type details.

Blood:

- Represents the actual unit of blood donated.
- Attributes such as Blood Type, Code, and Cost describe the donated blood.
- It links to the donor to track who provided the donation and is also stored and managed under a blood bank.

Receptionist:

- The receptionist is responsible for donor registration.
- Attributes include Employee ID, Name, Address, and Phone Number.
- This entity connects to the donor to establish that registration happens via an authorized staff member.

Blood Bank:

- Central to the system, this entity stores and manages the blood inventory.
- Each blood bank is identified by a Blood Bank Number (BNO) and contains attributes like Orders, Issues, and Stored Blood Types.

Blood Bank Manager:

- Oversees the operations of the blood bank.
- Attributes include Employee ID, Name, Email ID, and Phone Number.
- This ensures accountability and proper administration of the blood bank.

Hospital:

- Represents external entities that request blood.
- Attributes include Name, Address, and Phone Number.
- They place orders for specific blood types as per their medical needs.

Relationships in the Diagram:

Donor donates Blood:
This relationship connects donors to the actual blood units, allowing tracking of every donation.

Receptionist registers Donor:
Indicates the process of a donor being added into the system via the receptionist.

Blood Bank stores Blood:

Connects blood banks with the blood units they hold.

Manager manages Blood Bank:

Establishes that each blood bank is controlled by a designated manager.

Hospital orders Blood from Blood Bank:

Represents the requests hospitals make to the blood bank for blood units.

Issues and Orders:

These are linked to blood types and hospitals, showing the flow of requests and fulfillment from the system.

Purpose of the Diagram

This ER Diagram helps identify:

- The cardinality (one-to-many, many-to-one relationships).
- How each entity interacts with others in real-time operations.
- How to structure the database tables for efficient CRUD operations.
- The flow of responsibility, from donor registration to blood usage.
- By analyzing this ER Diagram, one can easily design the corresponding database schema, ensuring that all necessary data fields and relationships are covered. It also helps reduce redundancy and maintains data consistency across the system.

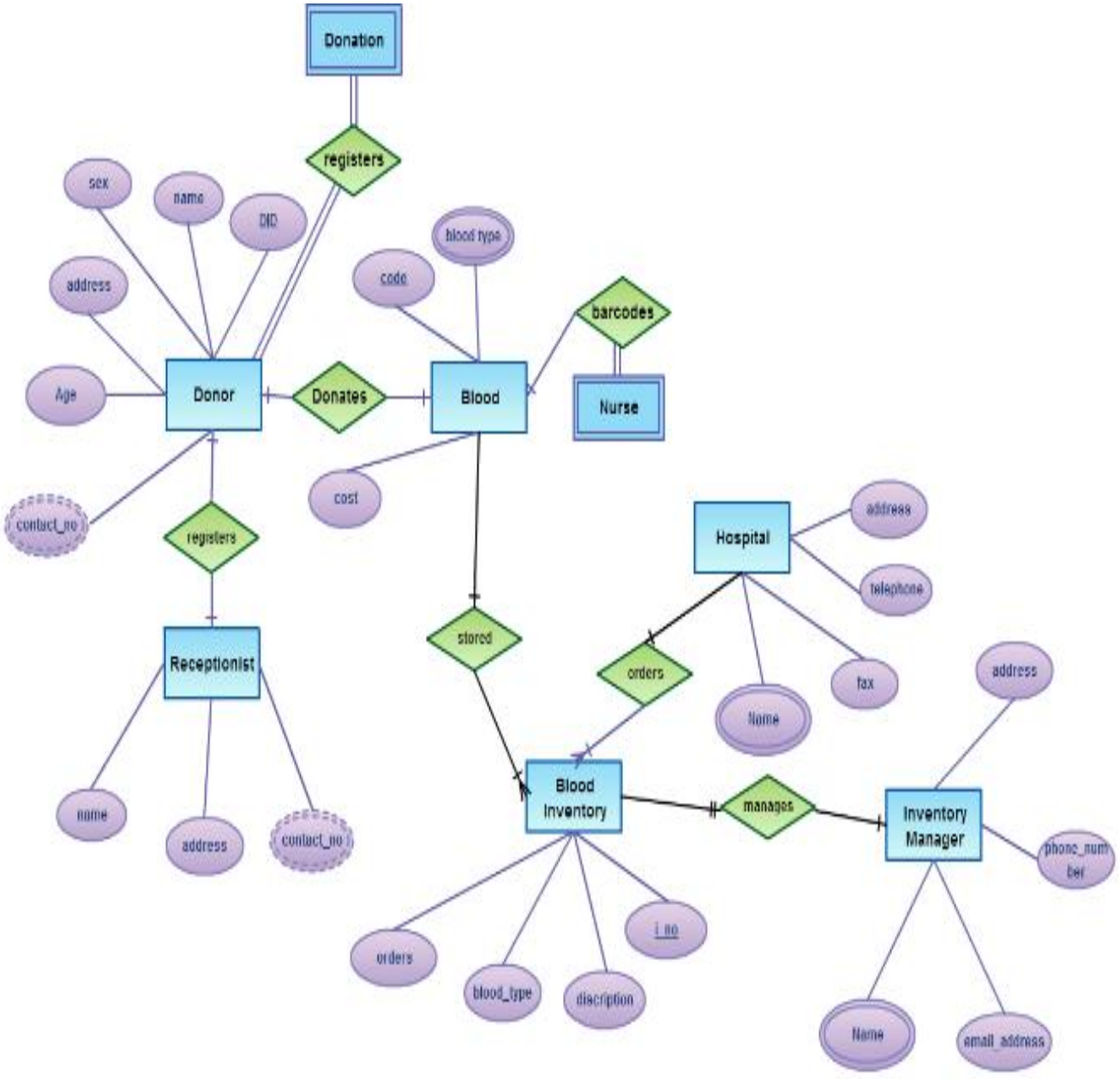


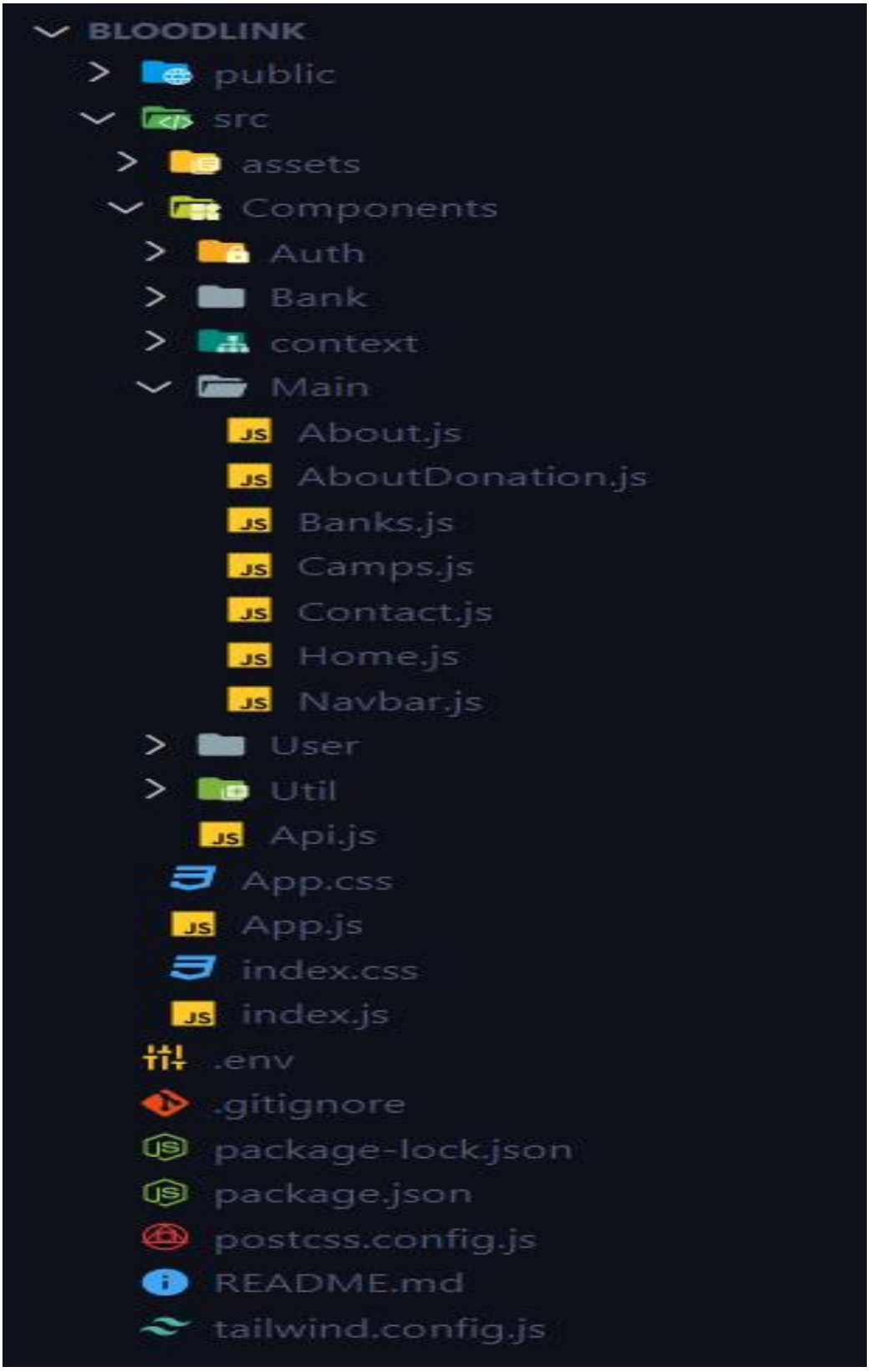
Figure 2:ER Diagram Blood Donation Management System

3.6 IMPLÉMENTATION

- Blood Link will work as a platform for users to register as blood to either request/donate blood and blood banks to manage their stocks by managing the pending donations and request along with scheduling blood camps and managing them. The system will authenticate the user/bank using their username(mobile) and password to further perform other actions.
- The milestones for the project include completing the database design, completing the user interface design, completing the back-end functionality, and completing testing.
- In addition, a notification and alert system will be integrated to inform users about upcoming blood donation camps, reminders for eligible repeat donors, and confirmations for donation requests.
- The system will also maintain a historical log of all transactions, including donation history, request approvals, and stock issuance, which can be reviewed by administrators for tracking and audit purposes.
- Role-based access will be implemented to ensure that different types of users (e.g., donors, blood bank staff, administrators) have access only to the features relevant to their responsibilities, enhancing system security.
- A dashboard feature will be provided for blood bank managers to view real-time stock levels, recent donations, pending requests, and urgent shortages to facilitate quick decision-making.
- The implementation process will also involve integrating SMS and email services to ensure efficient communication with both donors and hospitals.
- To ensure future scalability, the system will be developed using a modular approach, allowing new features to be added seamlessly without affecting the existing architecture.

- **Project structure & Architecture:**

Frontend



Backend

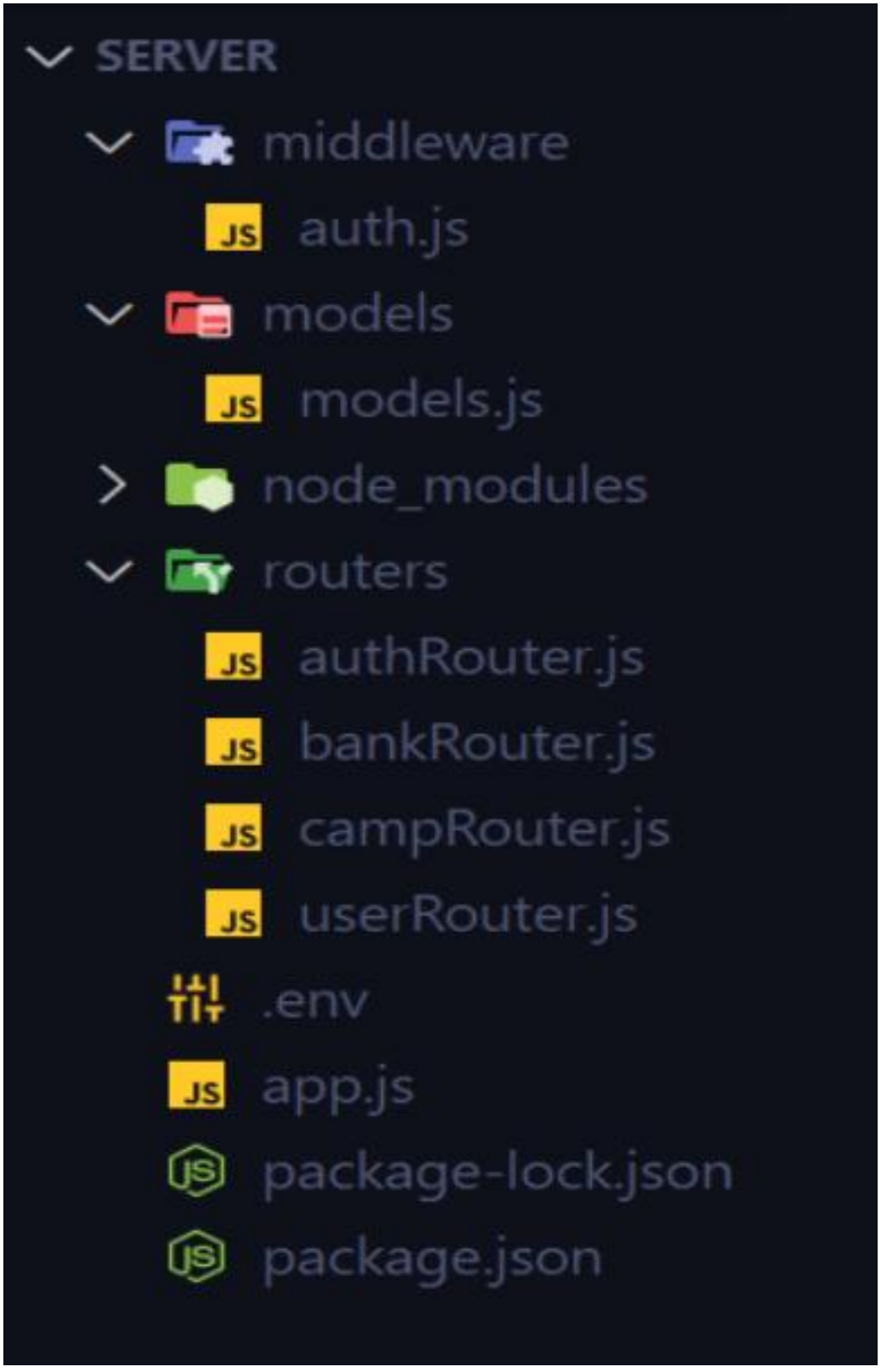


Figure 3: Project Structure & Architecture

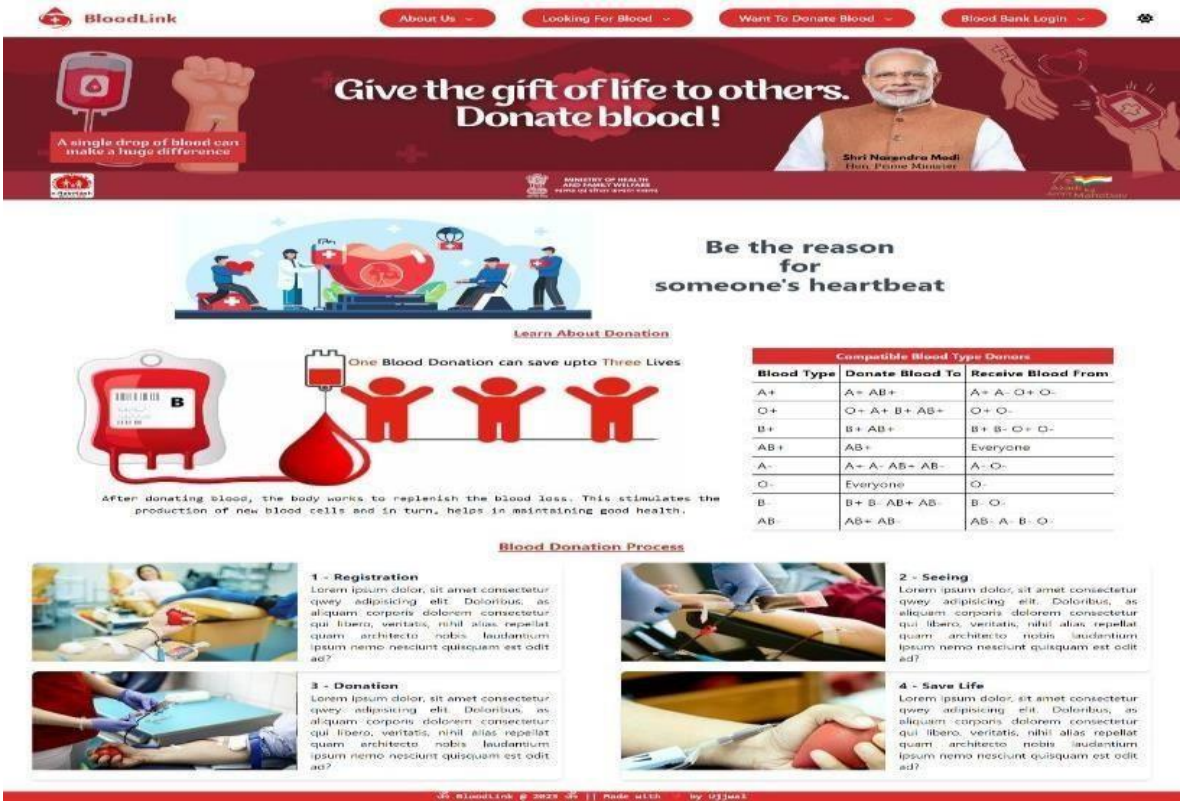
➢ Home:

- The home page of the website displays the navbar with position fixed at the top of the webpage with options available for the user to navigate across other pages with option available to switch between dark and light theme.
- The homepage also includes clearly visible access buttons such as "Want to Donate Blood", "Blood Bank Login", "Looking for Blood", and "About Us", providing users with immediate navigation to their intended action.
- These buttons are strategically placed in the center of the homepage with intuitive icons and vibrant colors to enhance user experience and ensure quick accessibility.
- A welcoming banner section describes the platform's purpose—helping save lives through organized and efficient blood donation services.
- Real-time updates on current blood availability and urgent requirements are displayed to keep users informed and prompt immediate action.
- The home page is mobile-responsive and includes a modern toggle to switch between light and dark modes for better visual comfort.
- A section showcasing real testimonials from donors and recipients helps build trust and motivates more users to contribute.
- Footer includes quick links to Privacy Policy, Terms & Conditions, Contact Us, and social media pages for extended connectivity.
- Quick Stats Section:

  A visually appealing dashboard-style area on the homepage that shows live stats like:

  - ✓ Total Blood Donors Registered
  - ✓ Units of Blood Available
  - ✓ Successful Donations
  - ✓ Active Blood Banks

  These stats update dynamically and give users a sense of the platform's impact, encouraging trust and participation.
- Tagline: "Donate Blood, Save Lives – Be Someone's Hero Today!" — This powerful message is highlighted on the homepage to inspire and encourage user participation.



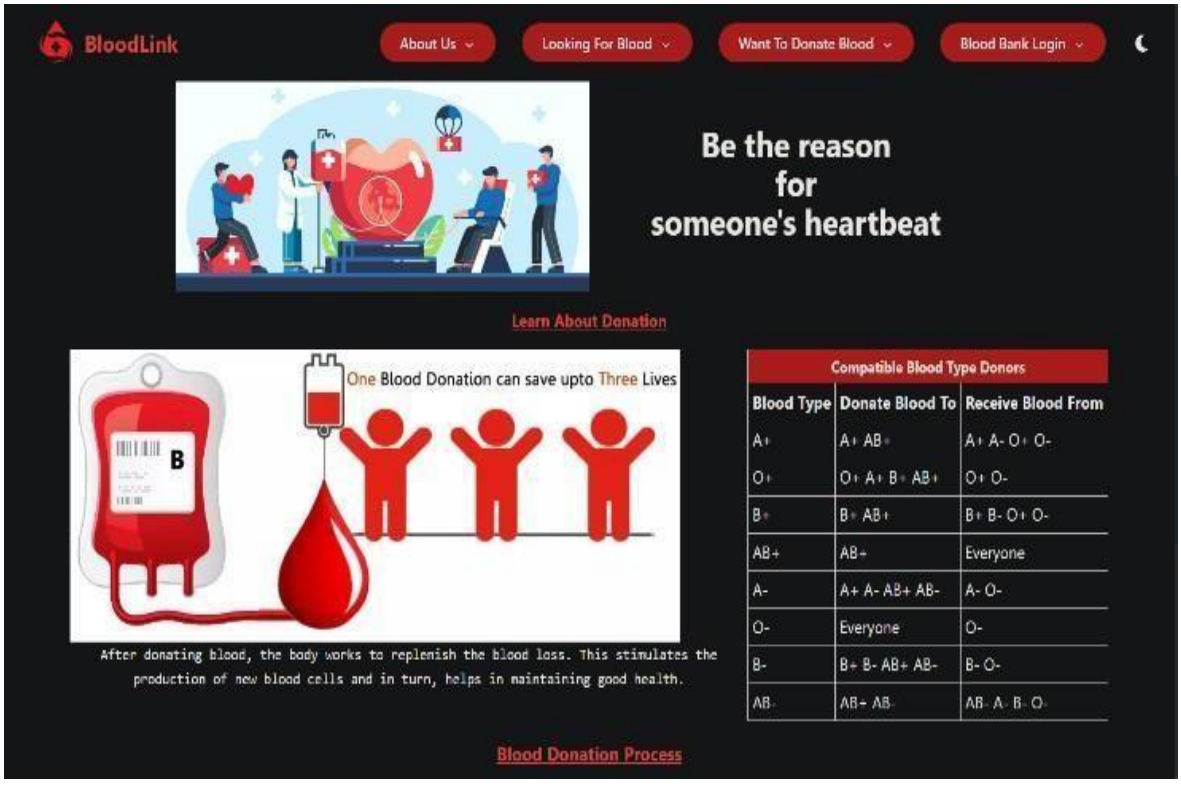


Figure 4: Home Page

➢ About, Contact, About Blood Donation, Blood Bank Directory & Blood Donation Camps:

- These are the options in the sub-menu of the navbar for user to know about us, the system, the process of blood donation and to get access to the list of the blood donation camps scheduled by different blood banks that can be filtered by either state, district and the date scheduled. The Blood Bank Directory option lets the user to see the list of all the blood banks registered and the details like name, location, contact number, and availability status of blood units in each bank.
- The About page gives a detailed overview of the platform, its vision, mission, and how users can contribute to the cause of saving lives.
- The Contact section allows users to send queries or feedback through an integrated form, as well as view contact details of the development/support team.
- The About Blood Donation section explains the importance, myths, and eligibility criteria of blood donation, aiming to educate and encourage new donors.
- The Blood Donation Camps section includes a calendar view or list view showing upcoming camps, with the ability to register directly for participation.
- These sections together aim to provide a complete informational and functional experience to the users, ensuring they are guided, informed, and motivated to take action.

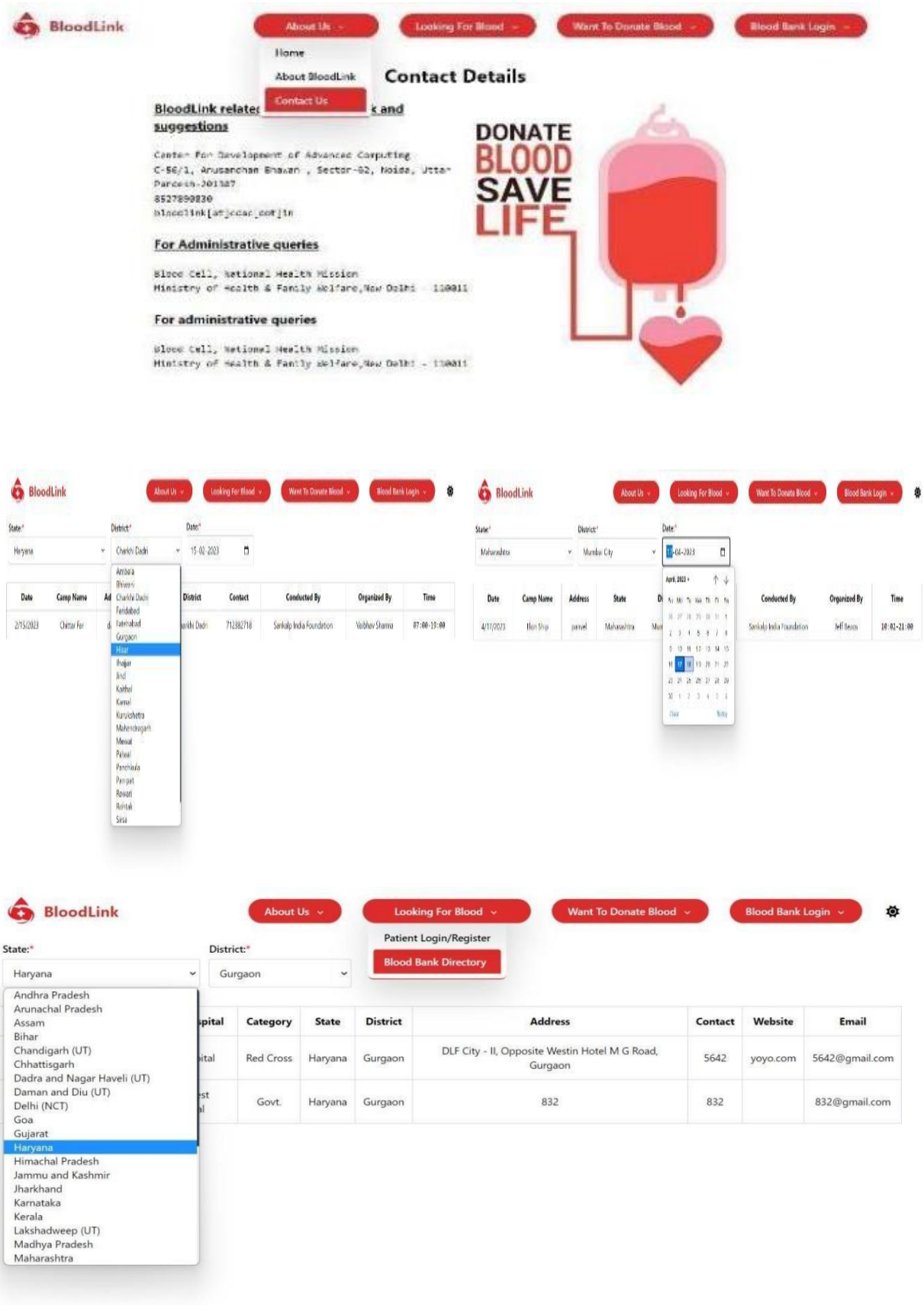


Figure 5: Blood Bank Directory

➢ Patient/Donor Registration & Log in:

Either donor or the one who is requesting for blood can register as a user using the Donor or Patient SignUp/Login page available by entering all the essential details like Name, Age, Gender, Blood Group, Email, Mobile, Password & Address Details.

Additionally, the system verifies the email or mobile number to ensure authenticity and prevent duplicate registrations. Users will also have the option to update their profile information and manage their account settings post-registration. A secure login system ensures user data confidentiality, and session management keeps the account protected during usage.

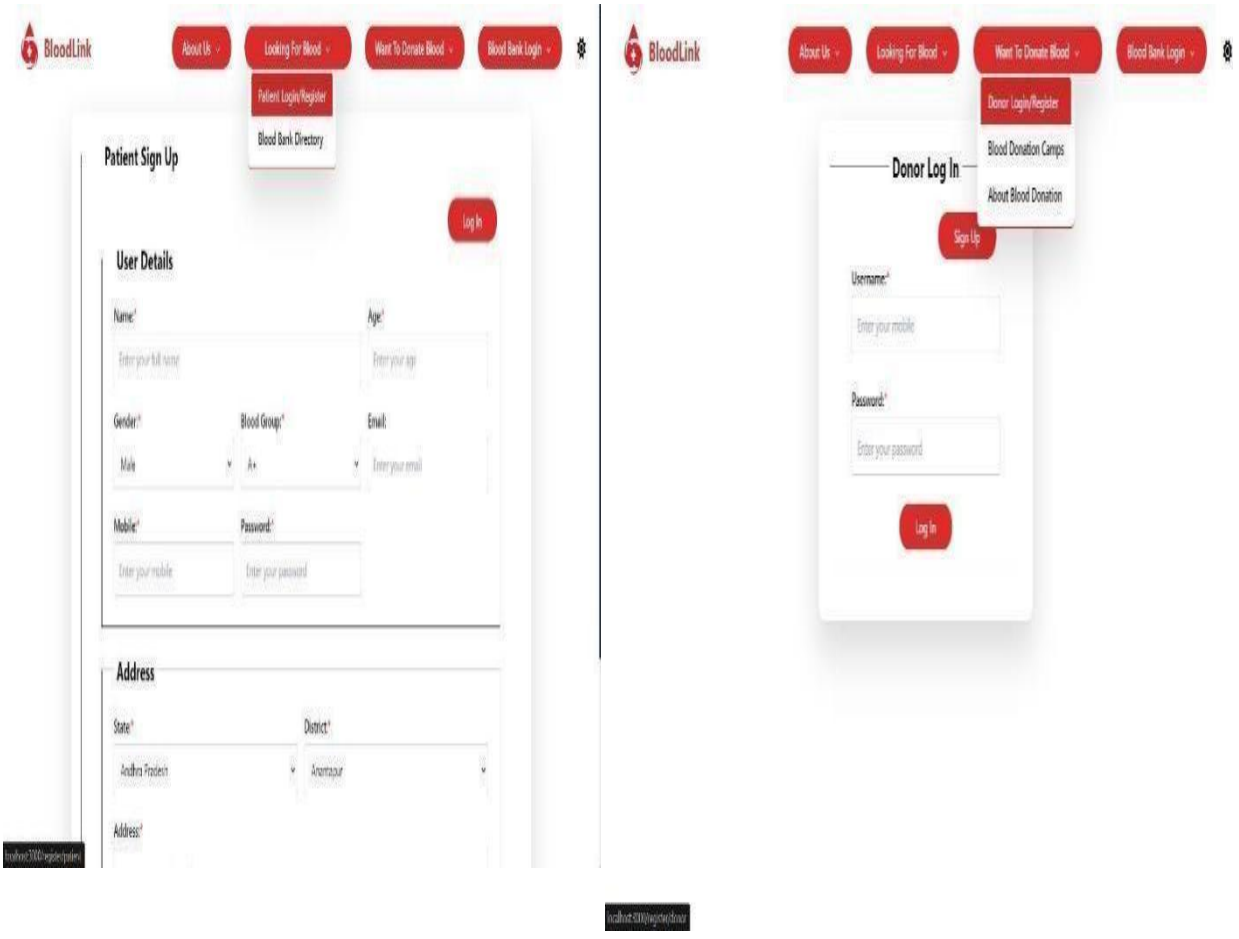


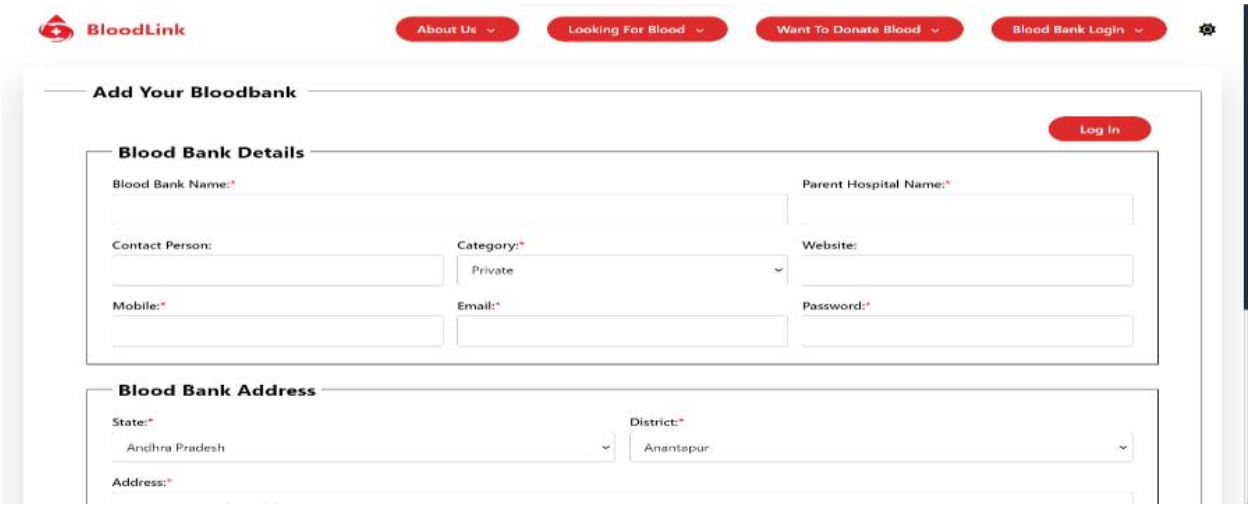
Figure 6: Patient/Donar Registration & Login

➢ **Blood Bank Registration & Login:-**

New Blood Banks can register on the portal using `Add your Blood-bank` option available under `Blood Bank Login` in Navbar and the already registered can login using `Login` available under the same.

Blood Banks can register by entering the essential info including Blood-bank Name, Parent Hospital Name, Contact Person, Category, Website, Mobile, Email, Password & Address details. Here, the address will include the state, district and complete address including the geographic location co-ordinates of the bank which can be fetched at that time using `Fetch Geocode` option available.

In addition to this, once registered, blood banks will gain access to a dedicated dashboard to manage blood stock availability, incoming donor data, and requests from patients. They will also receive automated alerts for low stock levels and can generate reports to analyze donation and supply trends. All registered blood banks must verify their credentials through an email or admin verification process to ensure data authenticity and prevent fraudulent listings.



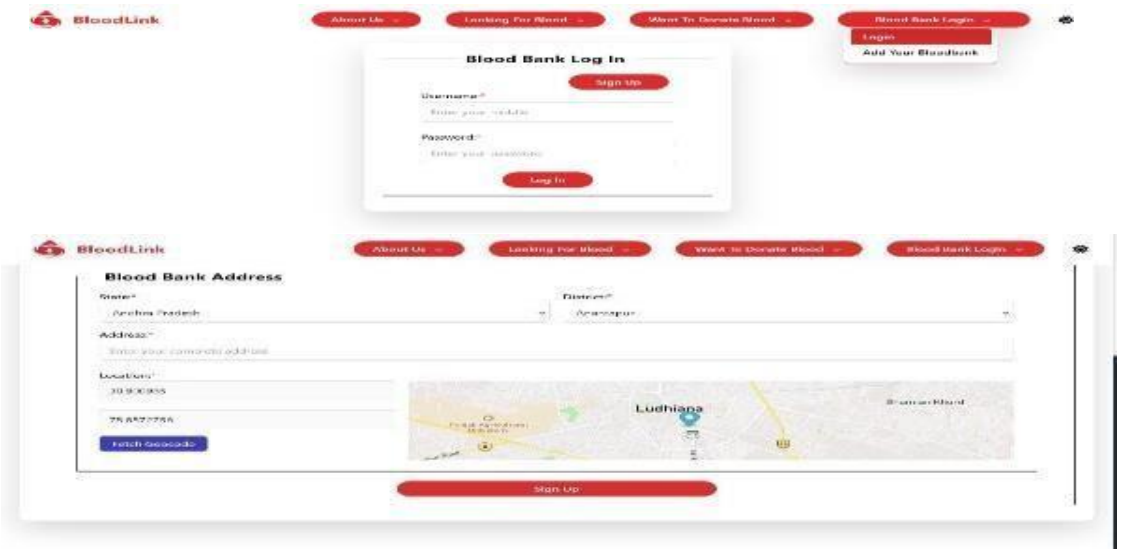


Figure 7: Blood Bank Registration & Login

➢ **Authentication:**

The authentication of the users during registration and logging in has been done using JWTs (Json Web Tokens), a JWT will be signed every time any user/bank registers or logs into the website which will be stored as the cookie in the user's browser with a max expiration age scheduled after which user will need to log in again.

- This JWT token will be a random string of characters which will get verified at the backend and authenticate the user. To check the authenticity of the user logged in, a request will be sent to the backend using a api route which will return a Boolean value after verifying the JWT token of the user basis on which the logged in bank/user will be able to access all services.

➢ **Security:**

For security purpose, the password saved at the server will be a encrypted hash value generated after the user's registration which will neither be known to database administrators nor the system managers and the backend. The middle-ware will match the hash value of the entered password by user on logging in with the hash value stored in the database to authenticate the user.

User Side

➢ **Main:**

- The user logged in will have an access to different options for editing his/her profile, donate blood, request for blood, see donation/requests history and to register for a blood donation camp.

- The navbar will be changed for the logged-in user for navigating to the about, contact us, my profile page and to logout.

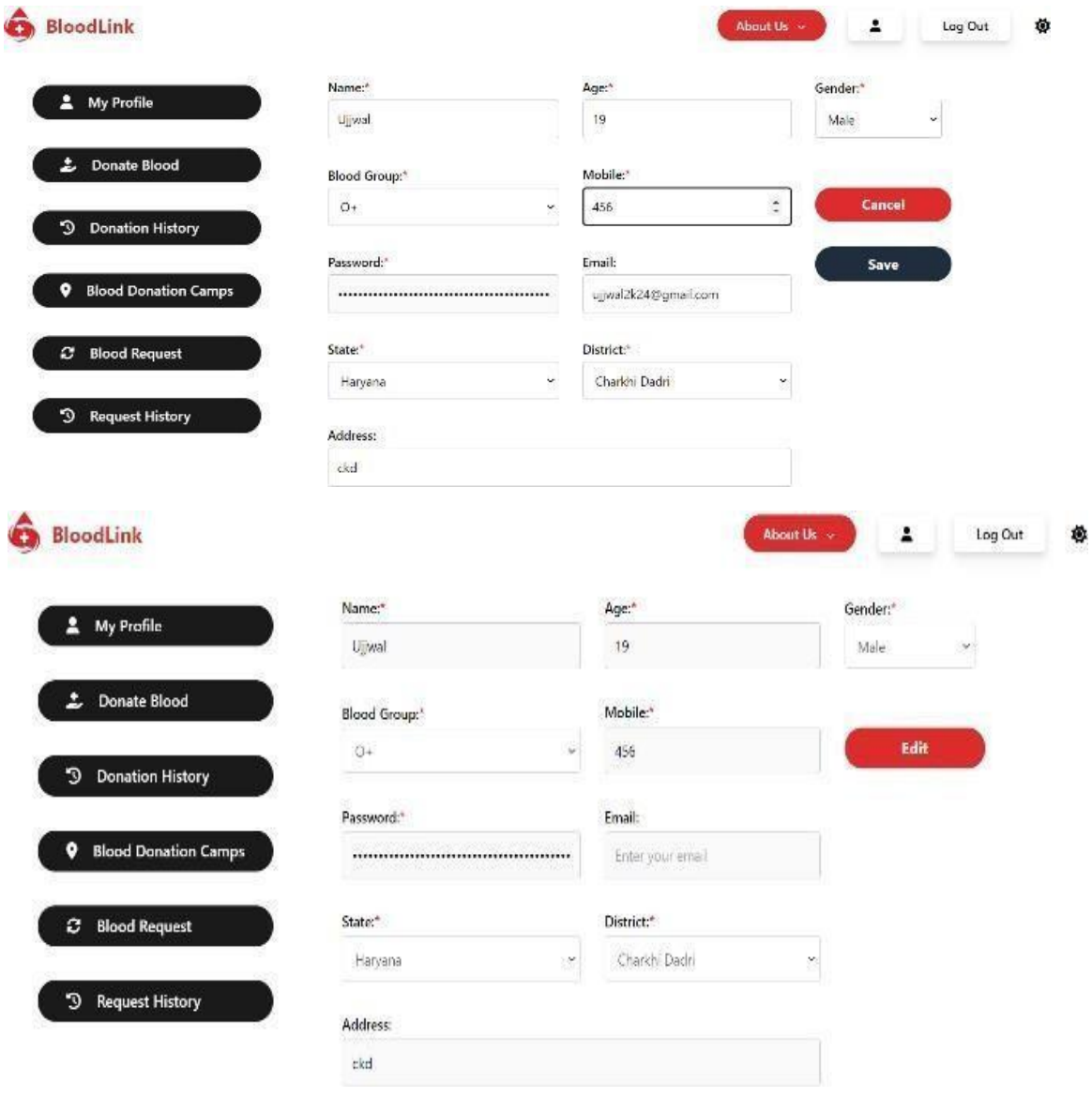


Figure 8: User Side

➢ **Donate Blood:**

The logged-in user can donate blood by entering the units they want to donate and any disease if they have and can choose blood bank by state and district where they want to donate. Name & age will get auto-filled as per the details of the current logged-in user.

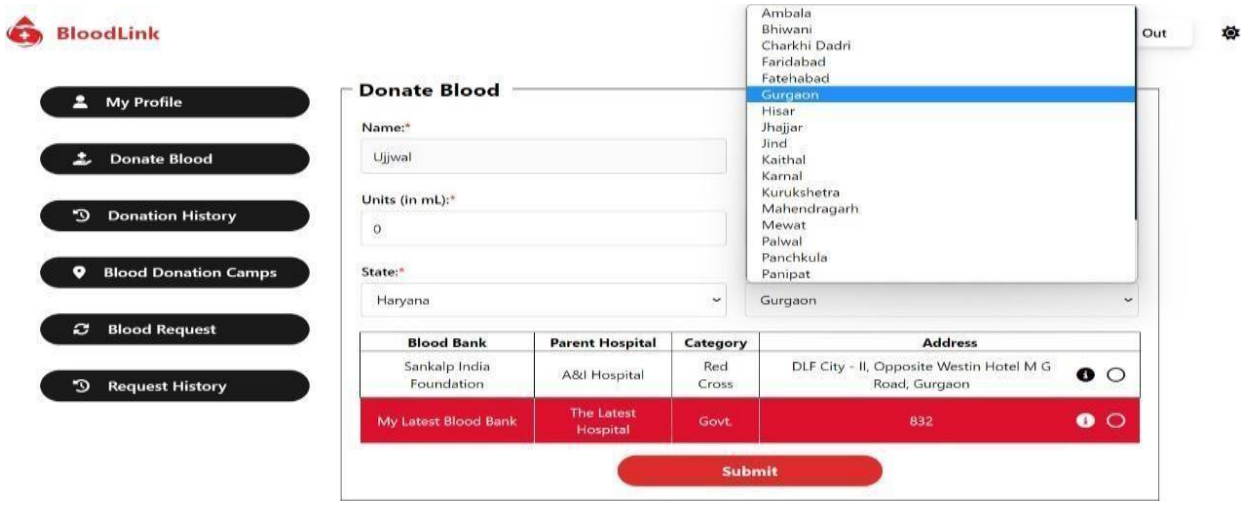


Figure 9: Donate Blood

There will be an extra option also available for the user to see the complete details of the blood bank.

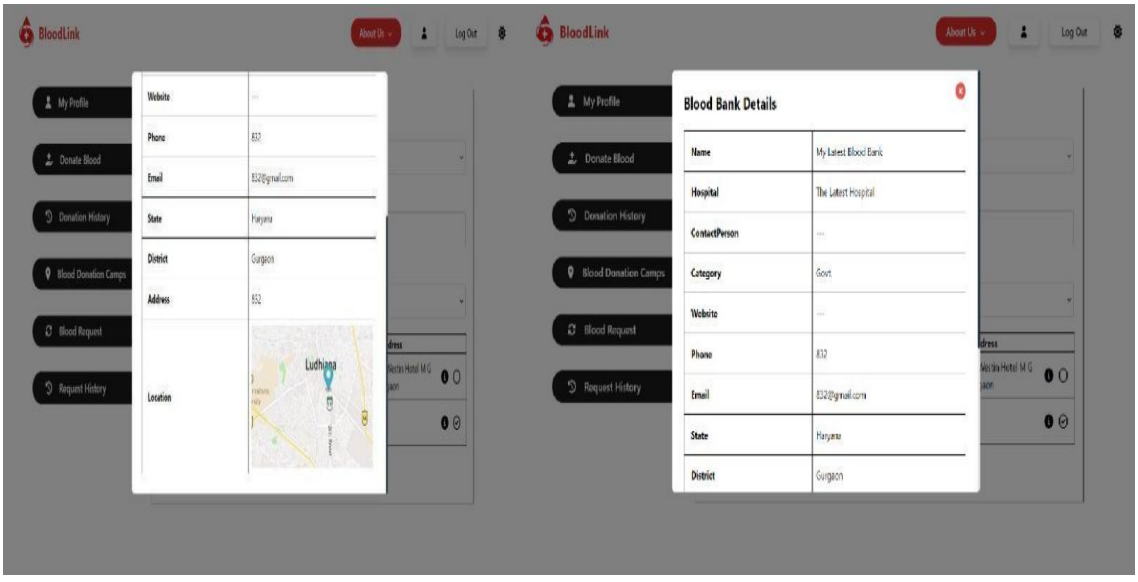


Figure 10: Details of Blood Bank

➢ **Donation History:**

- Users will have easy access to view their complete donation history, along with the status of each request—whether it's Pending, Approved, or Donated.
- They can also click on any blood bank name to view its full profile, including location, contact details, and services offered.
- In addition, each donation record will show the exact date of donation, the type of blood component donated (like Whole Blood, Plasma, or Platelets), and whether the donation has been officially verified by the blood bank.
- Users can filter or search their donation history by date, status, or blood bank name for quick reference. For every successful donation, users can download a digital certificate of appreciation.
- The system also provides friendly reminders for the next eligible donation date, helping users stay active and engaged in saving lives regularly.

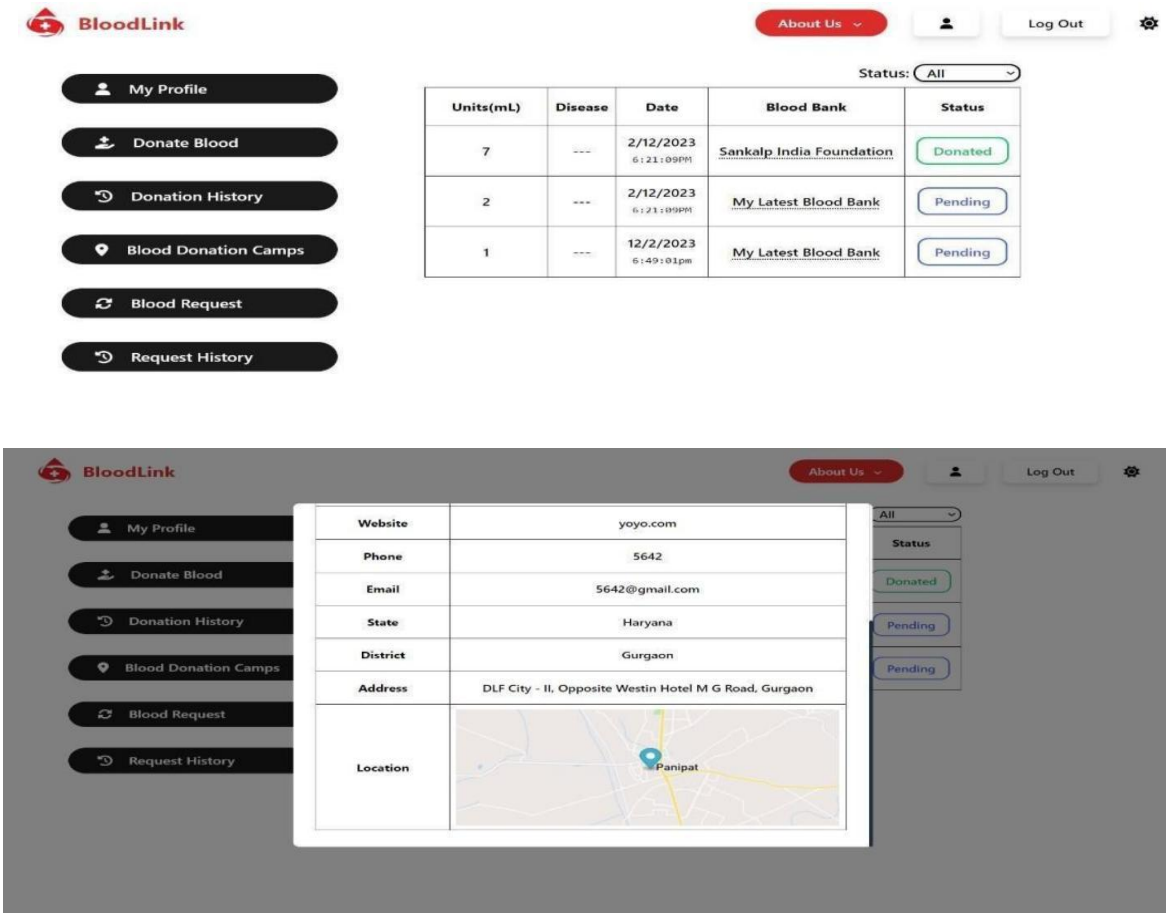


Figure 11: Donation History

➢ **Blood Donation Camps:**

- Users can register for upcoming blood donation camps scheduled by different blood banks and can also filter them by state and district for easier access to nearby events.
- Each camp listing will display important details such as the date, time, venue, organizing blood bank, and available slots.
- Users can also view maps for directions and get notifications or reminders for the camps they've registered for.
- A brief description of each camp—including special events, awareness sessions, or health check-ups—will help users understand what to expect.
- Once registered, users can manage or cancel their participation through their dashboard. After attending, the system will automatically update their donation history and may offer a certificate of participation.
- Camps can also be marked as "Full" once capacity is reached, and users can join a waiting list or get suggestions for alternate nearby camps.

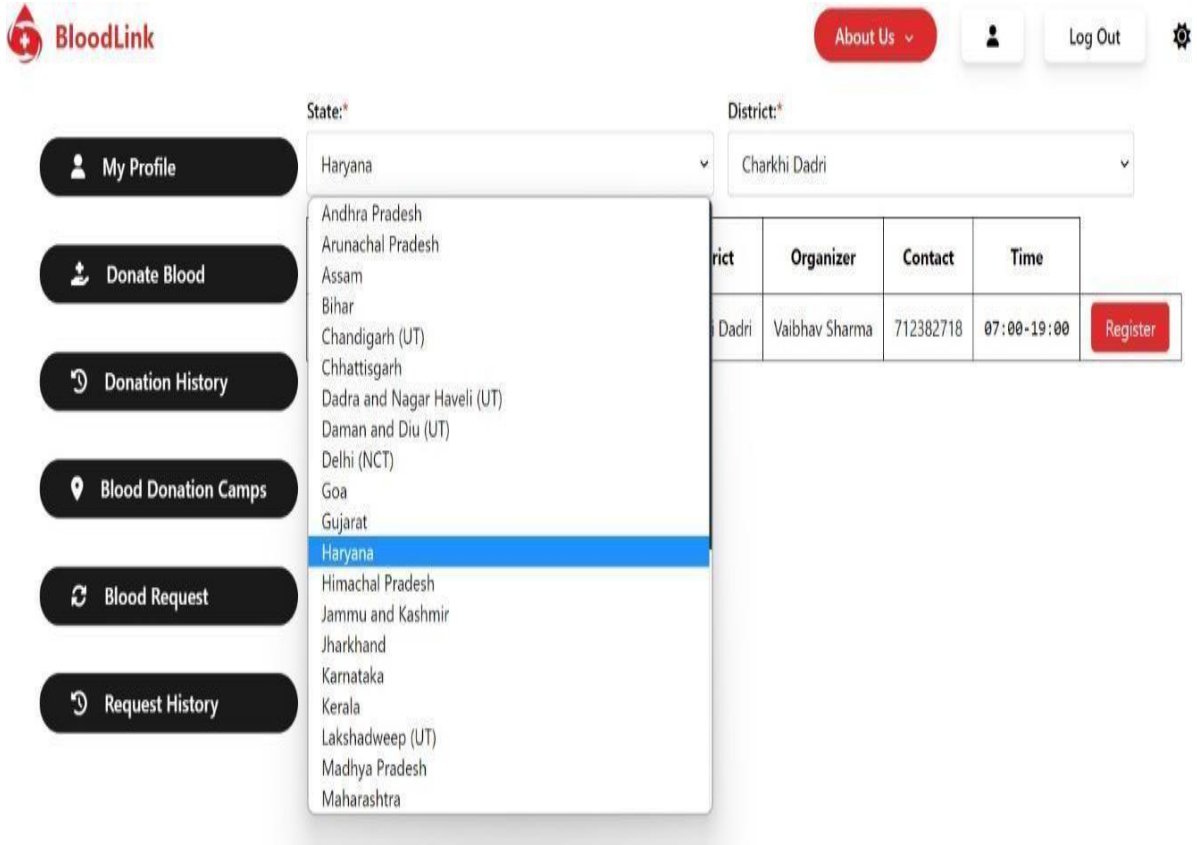


Figure 12:Blood Donation Camp

➢ **Blood Request:**

- Users can request blood either for themselves or on behalf of someone else. If the user is requesting for themselves, the fields such as Name, Age, Blood Group & Gender will be auto-filled from their profile.

- They only need to enter the number of units required, the reason for the request, and select a blood bank by filtering them based on state and district.

- Users can view complete bank details using the i (info) button, just like on the Donate Blood panel.

- In addition, the system validates the entered data and checks the availability of the required blood group at the selected bank in real-time before proceeding.

- Users will receive updates on the status of their request (Pending, Approved, Fulfilled) through SMS or email notifications.

- They can also attach supporting documents (like doctor's prescription or hospital letter) if needed for emergency cases.

- Once a request is submitted, it is logged in the user's Request History, where they can track or cancel it if required.

- To ensure transparency, the system may also show an estimated response time or allow users to contact the selected blood bank directly from the portal.

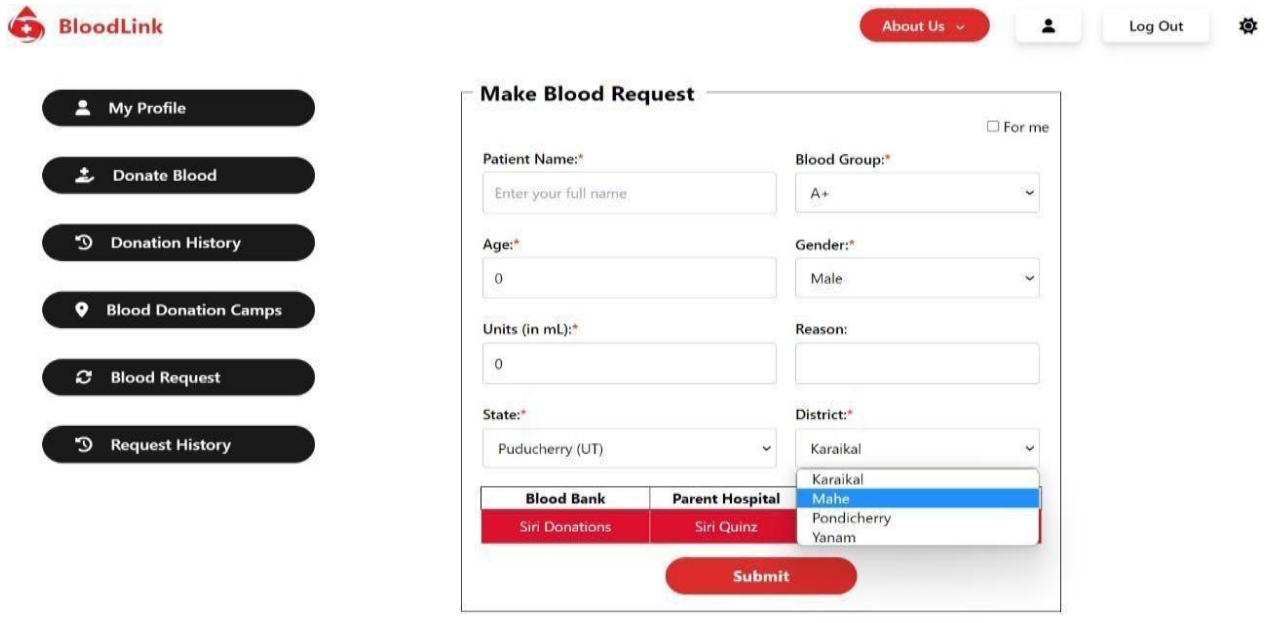


Figure 13: Blood Request

- **Request History:**

1. Request ID
- Add a unique ID to each request for easy reference.

2. Date of Request
- Show the date and time when the request was submitted.

3. Bank Name (Clickable)
- Make the bank name a clickable link or button that opens a *detailed view* with bank information.

4. Status Column
- Show the request status: Pending, Approved, or Completed using colored tags (e.g., green for completed, yellow for pending).

5. Remarks/Notes
- Add a column where users or admins can write short notes (e.g., "Awaiting Documents", "Sent for Approval").

6. Actions Column
- Add a simple “View Details” or “Delete” button for each request (optional).

7. Simple Sorting (optional)
- If you're using a table, you can allow sorting by date or status using basic JavaScript or even by refreshing the page with sorted data.

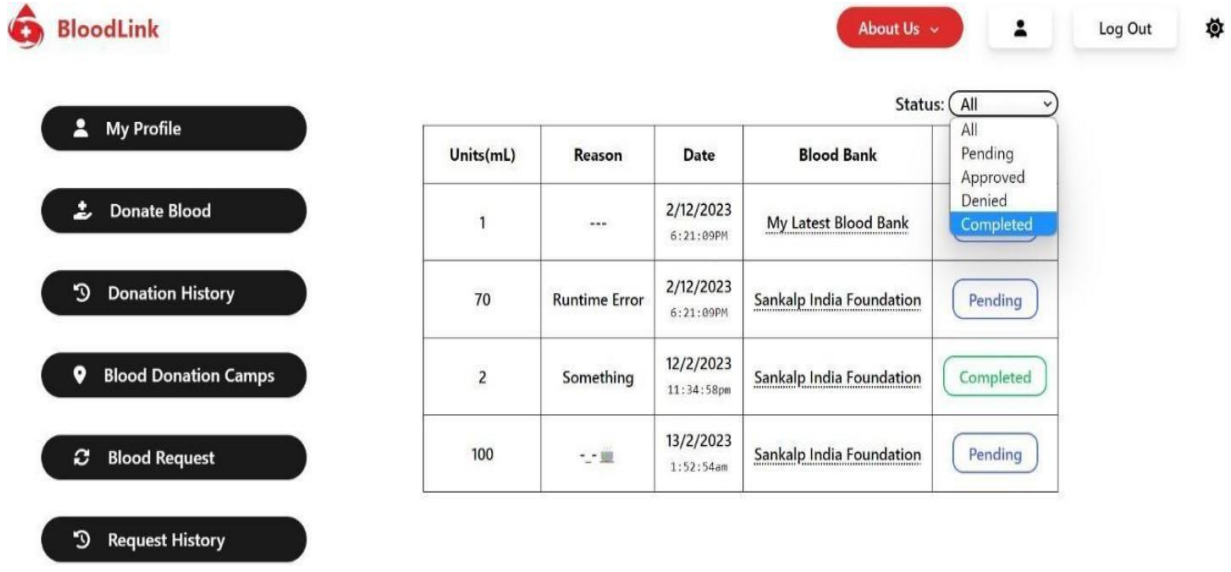


Figure 14: Blood Request History

Blood Bank Side

- **Main:**

- **Notifications Panel**

Blood banks receive alerts for new requests, approved donations, or upcoming blood donation camps directly on the dashboard.

- **Camp History**

A section to view all past blood donation camps, including date, location, total units collected, and donors attended.

- **Request Management Filters**

Easily filter incoming blood requests based on blood group, urgency level, or location

- **Stock Expiry Alerts**

Automated alerts for blood units that are nearing expiry, helping banks manage stock efficiently

- **Top Donors Leaderboard**

Display a list of frequent or top donors based on their number of donations—helps with recognition and engagement.

- **Document Upload for Camps**

Option to upload event photos, flyers, or reports while registering a blood donation camp.

- **Camp Participation Certificate Generator**

Option to generate and download donor certificates for each camp (can be PDF format).

- **Profile Picture and Bank Logo Upload**

Personalize the profile with the blood bank logo or image, visible across the platform.

- **Quick Action Buttons**

Add shortcut buttons on the dashboard for most-used features like "Add Stock", "Respond to Request", "Register Camp".

- **Feedback & Rating System**

  Option for hospitals or donors to give feedback to the blood bank after fulfilling a request.

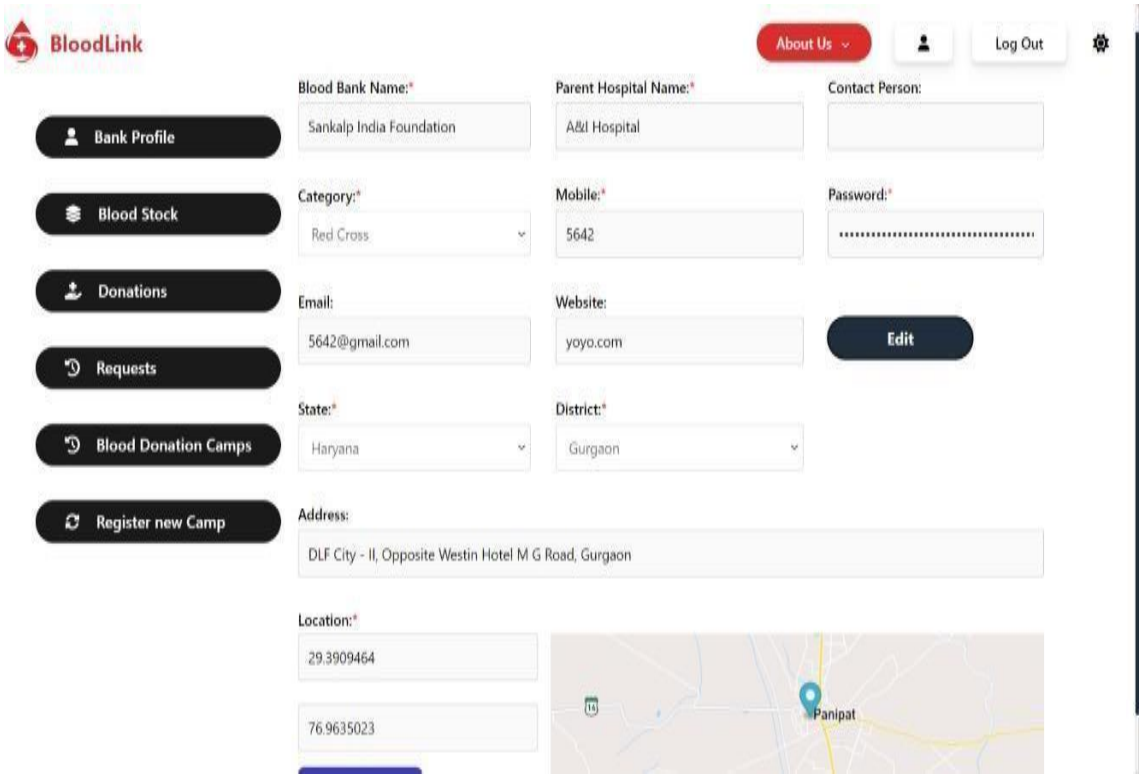


Figure 15: Blood Bank

- Once logged in, the blood bank gains access to a personalized dashboard designed to manage and monitor key operations. It can:

- ✓ View and update its profile details
- ✓ Check available blood stock across different blood groups
- ✓ View and respond to blood donation requests from hospitals or individuals
- ✓ Track all donations received and processed
- ✓ Manage and register blood donation camps to encourage more donors
- ✓ Navigate using a custom navbar that includes links to "About", "Contact Us", "My Profile", and "Logout".

➢ **Blood Stock:**

Blood stock` will show the current available blood stock at the current logged-in blood bank :

- Different types of blood group availability will be shown (A+, A−, B+, B−, AB+, AB−, O+, O−).
- Display can include units available, last updated date, and low stock alerts for each blood group.
- Option to manually update stock after receiving or issuing blood units.
- A color-coded indicator (e.g., red for low stock, green for sufficient) helps in quick stock analysis.
- Daily or weekly auto-updated stock reports can be generated for internal use.
- Integration with request management to prevent request approval if stock is unavailable.

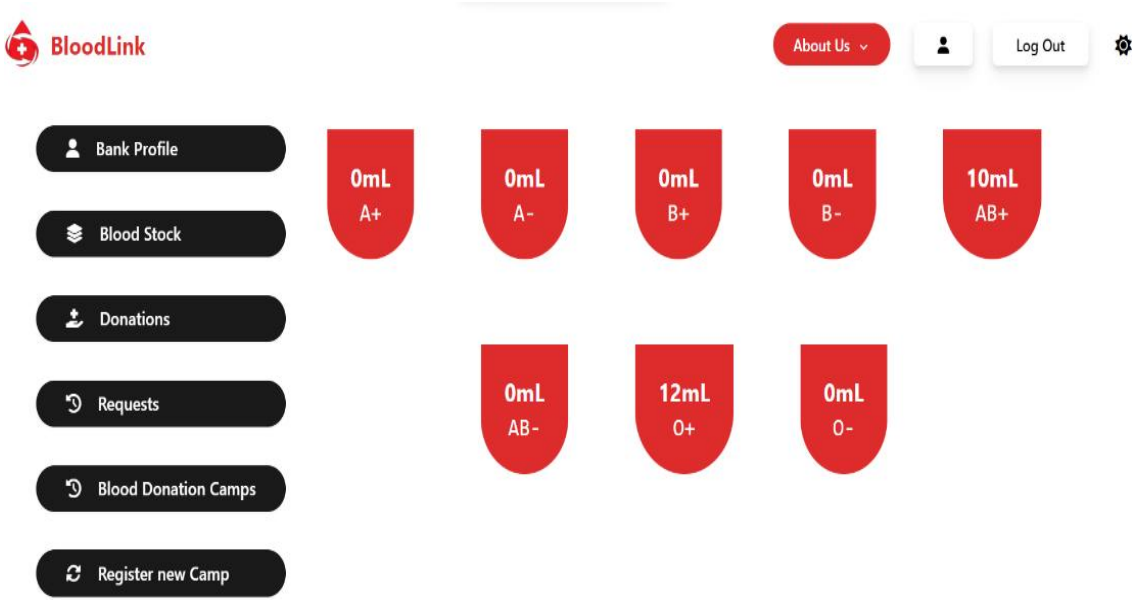


Figure 16: Blood Bank Blood Stock

➢ **Donations/Requests:**

These options will let the logged-in blood bank to see and manage the blood donation requests and the requests for blood by updating their status accordingly by the user details.

The complete details of the user can be seen here by clicking on the user's name underlined.

Upon clicking the user's name, a detailed view will show important information including:

- Patient Name
- Age
- Blood Group
- Gender
- Required Units
- Reason for Request (e.g., surgery, accident, emergency)
- Request Date
- Current Status (e.g., pending, approved, completed)

The blood bank can also update the status directly from this page (e.g., mark as fulfilled or rejected).

Each request can include contact details or hospital information for coordination.

Option to sort or filter requests by blood group, status, or date for easier management.

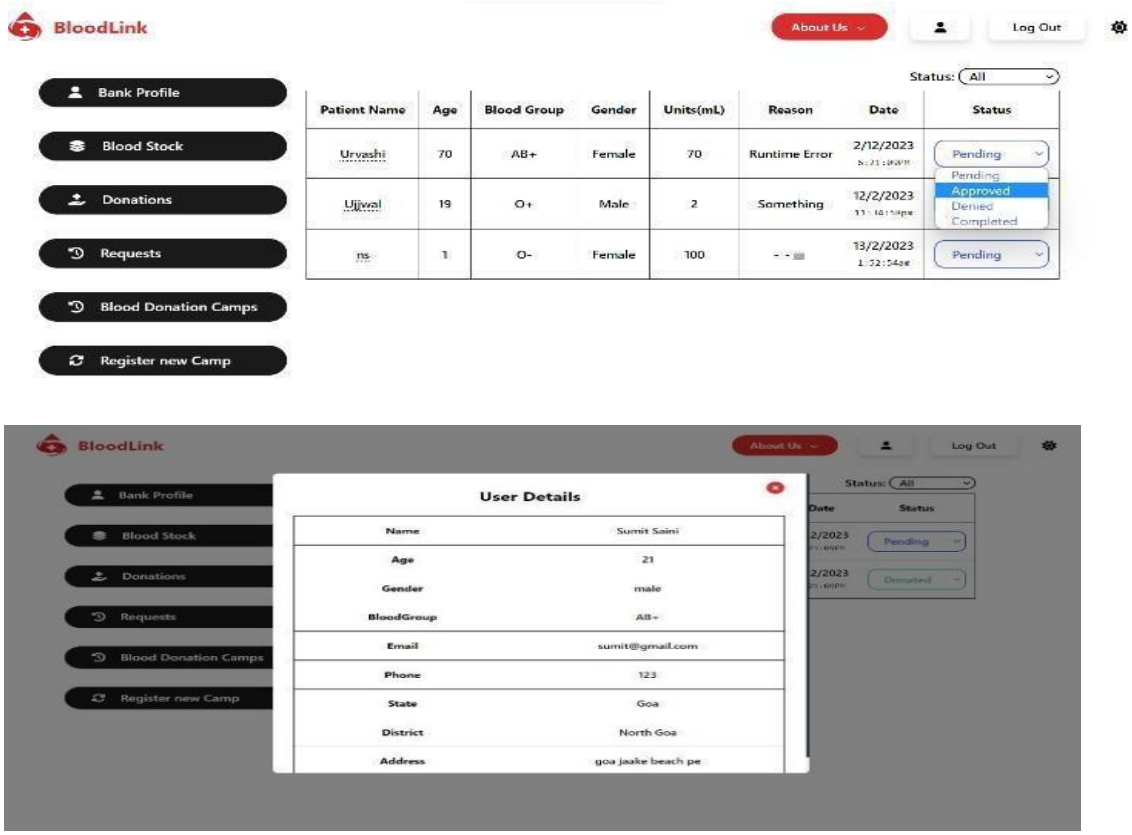


Figure 17: Blood Donation Request

➢ Blood Donation Camps:

Bank currently logged-in can see all of his registered blood donation camps and can edit using the “Edit” button provided.

On clicking the “Edit” button, a new window will be popped-up showing all the camp donors registered for the camp. Further clicking on the “i” button mentioned under every donor will open another pop-window and will show the complete details of the donor.

Bank can here update the donation value after the donation completion at the blood camp by the donor, any new user at the camp can register for the same by signing up directly from the options mentioned previously.

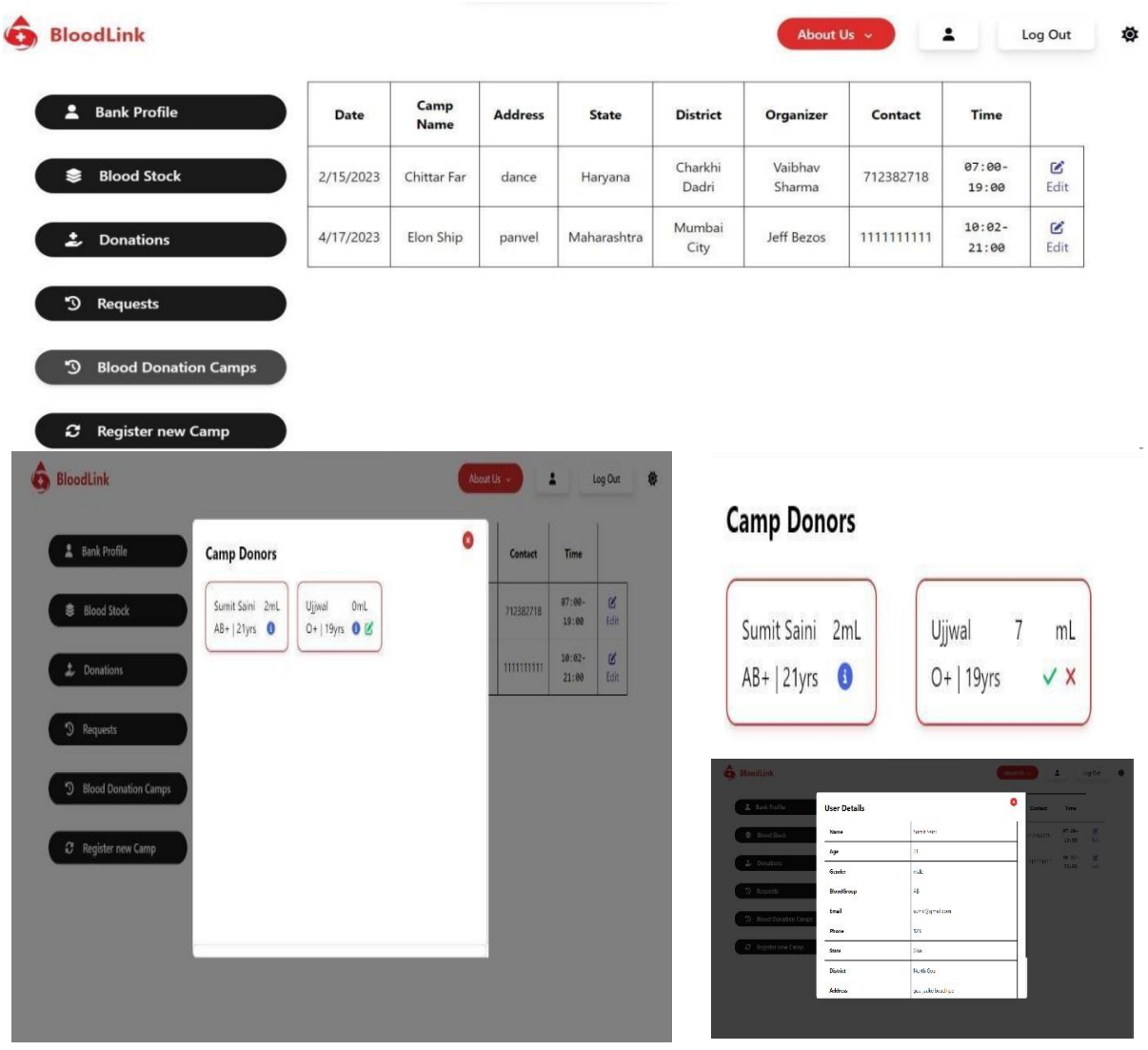


Figure 18:Blood Donation Camp

- **Register new camp:**

Bank can create/register a new blood donation camp by `Register new Camp` option available by specifying all details with the date & time duration of the camp.

Camp details like:

- Name of the Camp
- Conducted By
- Organized By
- Contact Number
- Date
- Start Time
- End Time
- Additional notes or description (e.g., target units, purpose, expected donors)
- Camp Type (e.g., voluntary, replacement, emergency)
- Mode of Donation (e.g., whole blood, plasma, platelets)
- Availability of Medical Facilities (e.g., ambulance, first-aid)
- Number of Staff Members (optional but helpful for planning)
- Refreshments Availability (optional: to inform donors about post-donation care)
- Blood Bank Coordinator Name & Contact (for direct coordination)
- Special Instructions or Announcements (e.g., guest speaker, awareness session)
- Option to Set Maximum Donor Limit (to manage crowd and logistics)

Address details like:

- State
- District
- Exact Address / Venue
- Nearby landmark (optional for easier location tracking)
- Pincode (for precise mapping or logistics)

Option to upload poster/image for the camp (optional).

A preview button before final submission to review all entered details.

Once registered, the camp is visible under the bank's camp history and can be edited if needed before the scheduled date.

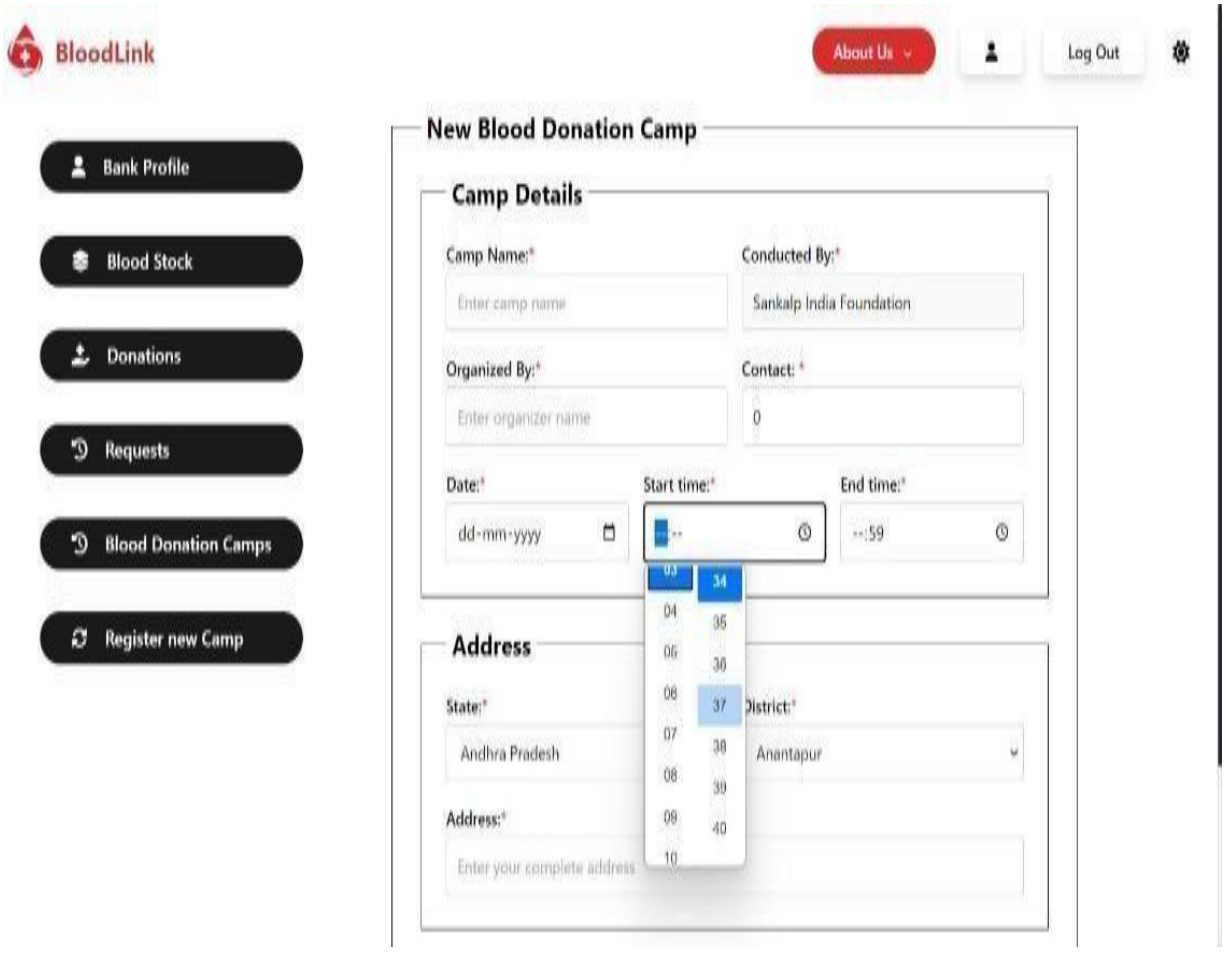


Figure 19: Blood Donation New Camp Register

CHAPTER 4

DATABASE DESIGN & SCHEMA

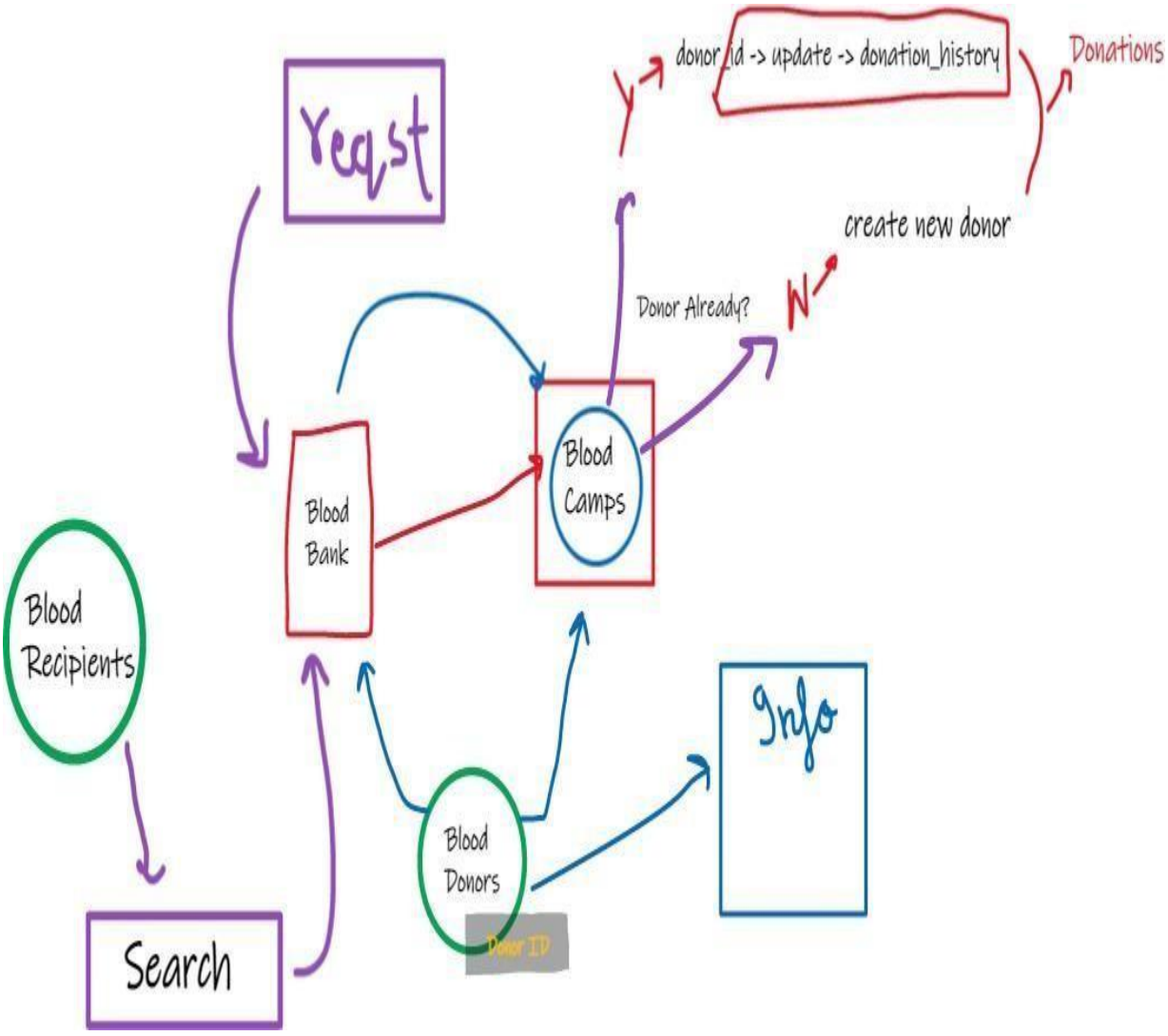


Figure 20: Blood Donation Management System Database Design

- **Blood Recipients**

✓ Represent people who are in need of blood.
✓ They initiate a **Search** to find available blood based on criteria like blood group, location, etc.

- **Search Functionality**

✓ Used by recipients to find matching blood units from blood banks.
✓ Searches data from **Blood Bank** collections.

- **Blood Bank**

✓ Central entity managing the blood stock.
✓ Responsible for receiving, storing, and updating blood units.
✓ Communicates with **Blood Camps**, **Requests**, and **Blood Donors**.

- **Request**

✓ Blood recipients can raise a **Request** via the system.
✓ Request flows to the **Blood Bank** for verification and processing.

- **Blood Camps**

✓ Events created to collect blood donations.
✓ Linked to **Blood Bank** for logistics and data updates.
✓ During donation, system checks:
➤ **"Donor Already?"**

✧ **Yes (Y):**
→ Donor ID is fetched
→ System **updates donation history** under **Donations collection**
✧ **No (N):**
→ New donor is created in the **Blood Donors collection**

- **Blood Donors**

✓ Individuals donating blood at camps or directly at banks.
✓ Have unique **Donor IDs**
✓ Data stored and updated during donation events (history, eligibility, etc.)
✓ Interacts with **Info** and **Blood Camps**

- **Info**

✓ Likely represents additional information or help sections.
✓ Could be donor guidelines, eligibility criteria, camp schedules, etc.

The database used for the Blood-link project is MongoDB, a No-SQL database.

The following collections are being used to store and organize the data for the project: Users, Blood-banks, Donations, Requests, Camps.

- **Users:**

```
// ------- User Model -------

// Create schema for Users
const userSchema = new mongoose.Schema({
    name: { type: String, required: true },
    age: { type: Number, required: true },
    gender: { type: String, required: true },
    bloodGroup: { type: String, enum: bloodGroups, required: true },
    email: { type: String },
    phone: { type: Number, unique: true, required: true },
    password: { type: String, required: true },
    state: { type: String, required: true },
    district: { type: String, required: true },
    address: { type: String },
});

// Create model for Users
const User = mongoose.model('Users', userSchema);
```

- **BloodBanks:**

```
// Create schema for Blood Banks
const bloodBankSchema = new mongoose.Schema({
    name: { type: String, required: true },
    hospital: { type: String, required: true },
    contactPerson: { type: String },
    category: { type: String, required: true },
    website: { type: String },
    phone: { type: Number, required: true },
    email: { type: String, required: true },
    password: { type: String, required: true },
    state: { type: String, required: true },
    district: { type: String, required: true },
    address: { type: String, required: true },
    latitude: { type: Number, required: true },
    longitude: { type: Number, required: true },
    requests: [{
        requestId: { type: mongoose.Schema.Types.ObjectId, ref: 'Requests' },
    }],
    donations: [{
        donationId: { type: mongoose.Schema.Types.ObjectId, ref: 'Donations' },
    }],
    stock: {
        'A+': { type: Number, default: 0 },
        'A-': { type: Number, default: 0 },
        'B+': { type: Number, default: 0 },
        'B-': { type: Number, default: 0 },
        'AB+': { type: Number, default: 0 },
        'AB-': { type: Number, default: 0 },
        'O+': { type: Number, default: 0 },
        'O-': { type: Number, default: 0 }
    }
});

// Create model for Blood Banks
const BloodBank = mongoose.model('BloodBanks', bloodBankSchema);
```

➢ **Donations:**

```
// ------- Donations Model -------

// Create schema for Donations
const bloodDonations = new mongoose.Schema({
    userId: { type: mongoose.Schema.Types.ObjectId, ref: 'Users', required: true },
    bankId: { type: mongoose.Schema.Types.ObjectId, ref: 'BloodBanks', required: true },
    units: { type: Number, required: true },
    date: { type: String, required: true },
    disease: { type: String },
    status: { type: String, required: true,
              enum: ['Pending', 'Approved', 'Denied', 'Donated'],
              default: 'Pending'
            },
});

// Create model for Donors
const Donations = mongoose.model('Donations', bloodDonations);
```

➢ **Camps:**

```
// Create schema for Camps
const campSchema = new mongoose.Schema({
    name: { type: String, required: true },
    date: { type: Date, required: true },
    address: { type: String, required: true },
    state: { type: String, required: true },
    district: { type: String, required: true },
    bankId: { type: mongoose.Schema.Types.ObjectId, ref: 'BloodBanks' },
    organizer: { type: String, required: true },
    contact: { type: Number, required: true },
    startTime: { type: String, required: true },
    endTime: { type: String, required: true },
    donors: [{
        _id: { type: mongoose.Schema.Types.ObjectId, ref: 'Users', unique: true },
        units: { type: Number, required: true, default: 0 },
        status: { type: Number, enum: [0, 1], default: 0 }
    }]
});

// Create model for Camps
const Camp = mongoose.model('Camps', campSchema);
```

CHAPTER 5

RESULT & DISCUSSION

The `Users` collection stores complete details of any registered user.

- ✓ Additional fields may include user type (donor/recipient), blood group, age, and eligibility status for donation.

➢ `Blood-Banks` collection stores complete details of the registered blood banks,

- ✓ The `requests` field here is an array of objects having request-id referring to the `Requests` collection.
- ✓ The `donations` field here is an array of objects having donation-id referring to the `Donations` collection.
- ✓ The `stock` field is an object with all the blood groups as keys and value of the units of the stock of each blood group available.
- ✓ It may also include location coordinates (latitude/longitude) for better tracking and emergency dispatch.

➢ `Donations` collections stores every donation request made by the user, with user-id referring to the `Users` collection and bank-id referring to the `Blood-Banks` collection with the status of the request,units to be donated.

✓Timestamps for each donation (createdAt, updatedAt) and donation method (camp/bank) can be included for more detailed logs.

➢ `Requests` collections stores every request made for blood by the user, with user-id referring to the `Users` collection and bank-id referring to the `Blood-banks` collection with the status of the request, units requested,.

✓The urgency level (low/medium/high) and approval status can also be stored for effective prioritization.

➢ `Camps`schema stores the details of any camp scheduled by any blood bank where bank-id is referring to `Blood-banks` collection and donors field is an array of objects with _id referring the `Users` collection, the units donated and the status.

✓Additional fields may include: venue images, list of volunteers involved, event feedback from donors and organizers.

➢ All the fields referring to other collections will get populated using the populate() in mongoose accordingly to get the complete data.

- ✓ This approach improves query efficiency and allows easy aggregation of data across different collections.

CHAPTER 6

CONCLUSIONS AND SUGGESTIONS FOR FURTHER WORK

CONCLUSION:

The development of the Blood Donation Management System using CRUD operations marks a significant milestone in modernizing and optimizing blood donation processes. This project has successfully addressed key challenges faced by blood banks, hospitals, and donation centers, offering a comprehensive solution for efficient data management, inventory tracking, donor-recipient coordination, and donation drive scheduling.

- ✓ Through the implementation of CRUD operations (Create, Read, Update, Delete), the system has demonstrated its ability to streamline data entry, retrieval, and management across various modules. The Donor Management module allows for accurate capture and maintenance of donor information, including medical history, contact details, and donation preferences.

- ✓ The Inventory Management module ensures real-time tracking of blood inventory levels, expiration dates, and storage locations, facilitating timely replenishment and waste reduction. The Donation Drive module enables organizers to schedule and coordinate donation events effectively, engage volunteers, and promote community participation.

- ✓ Additionally, the Recipient Management module supports the management of recipient information, transfusion records, and communication with healthcare providers, ensuring safe and timely blood transfusions.

- ✓ Moreover, the system promotes transparency and accountability by maintaining detailed audit logs of all transactions, ensuring traceability of donated blood from donor to recipient.

  The modular architecture also supports easy scalability, allowing future additions or upgrades without disrupting existing functionalities.

SUGGESTIONS FOR FURTHER WORK:

- ✓ **Integration with External Systems:** The system can be integrated with external systems such as hospitals, blood banks, and medical labs to provide real-time updates on blood availability and demand.

- ✓ **Mobile Application:** A mobile application can be developed to provide donors and recipients with easy access to the system. The application can include features such as push notifications for blood donation.

- ✓ **AI-Based Matching Algorithm:** Implementation of AI algorithms to match donors with recipients based on urgency, location, and blood compatibility could enhance efficiency and response time.

- ✓ **Automated Notifications**: Adding automated SMS or email notifications for reminders about donation eligibility, upcoming camps, and urgent blood requirements will improve user engagement.

✓ **Data Analytics Dashboard**: A visual dashboard with analytics and reports can be introduced to help administrators make informed decisions regarding stock levels, donor turnout trends, and high-demand blood types.

- ✓ **Blockchain Integration for Security:** Integrate blockchain technology to ensure secure, tamper-proof records of blood donations, transactions, and user data, enhancing transparency and trust.

✓ **Voice Command Functionality:** Incorporate voice-enabled commands for visually impaired users or those with limited digital literacy, improving accessibility.

- ✓ **Multi-Language Support:** Add support for multiple languages to accommodate users from different linguistic backgrounds and improve inclusivity.

- ✓ **Emergency Response System:** Implement a real-time emergency alert system that can notify nearby donors immediately in case of urgent blood requirements.

- ✓ **Gamification Features:** Introduce badges, levels, or rewards for frequent donors to encourage more participation and regular donations.

- ✓ **Donor Health Monitoring:** Link donor health status tracking with wearable devices or health apps to ensure donor fitness and safety before donation

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APPENDIX

Sample Dataset: You can include a sample data-set of donors, recipients, and blood donations to demonstrate the functionality of the system. This dataset can be used for testing and demonstration purposes.

User Manual: A user manual can be created to provide step-by-step instructions on how to use the system. The manual can include screenshots and descriptions of each module and feature.

Technical Documentation: Technical documentation can be created to provide details about the system architecture, database schema, and code structure. This documentation can be useful for future maintenance and development.

Testing Reports: Testing reports can be included to provide evidence of the system's functionality and performance. The reports can include details about the test cases, test scenarios, and test results.

Code Snippets: Code snippets can be included to demonstrate the implementation of specific features or functions. These snippets can be used to explain the system's design and functionality.

References: References can be included to provide credit to any external resources or libraries used in the project. This can include links to documentation, tutorials, and articles.

Legal and Ethical Considerations: Legal and ethical considerations can be included to address any potential issues related to data privacy, security, and consent. This can include details about the system's compliance with relevant laws and regulations**.**

Project Resource Repository

All components of the Blood Donation Management System project —including source code, Documentation, design, and final report are consolidated in the official GitHub repository linked below.

Official Repository

GitHub:

https://github.com/Saswat132002/BLOOD-DONATION-MANAGEMENT-SYSTEM

Repository Contents

The repository includes:

Section	Description
client/	Frontend source code built with React.js
server/	Backend source code developed using Node.js, Express.js, MongoDB
docs/	Project report, abstract, and user manual in PDF format
presentation/	Final project presentation slides (PPTX)
Readme.md	Complete technical overview and setup instructions

Key Features Available in the Repository

Full-stack web application source code (MERN)

Project documentation and technical report (ready for academic submission)

Blood bank dashboards and role-based interfaces

User manual and testing reports

Suggestions for future enhancement

Thank You!

Saswat Ranjan Nayak

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MCA – Final Year

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