International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 05 | May - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

Dare To Donate Application (An E-Blood Bank System)

Kavana Kumari L [1], Aishwarya P[2], Nidhi S Kumar [3], Dheemanth R[4], Shivakumar M [5]

[1] Assistant professor, Computer Science Engineering (Artificial Intelligence and Machine Learning) Department, Vidyavardhaka College of Engineering
[2] Undergraduate Student, Computer Science Engineering (Artificial Intelligence and Machine Learning), Vidyavardhaka College of Engineering
[3] Undergraduate Student, Computer Science Engineering (Artificial Intelligence and Machine Learning) Department, Vidyavardhaka College of Engineering
[4] Undergraduate Student, Computer Science Engineering (Artificial Intelligence and Machine Learning) Department, Vidyavardhaka College of Engineering
[5] Undergraduate Student, Computer Science Engineering (Artificial Intelligence and Machine Learning) Department, Vidyavardhaka College of Engineering

---

Abstract -

Dare To Donate application is a comprehensive online platform aimed at optimizing blood donation processes by prioritizing the referral of active blood donors and conducting thorough analyses of donor data. This system focuses on improving the efficiency of blood donation networks to ensure a consistent and sustainable blood supply for healthcare institutions. Its key feature involves a user-friendly interface allowing potential donors to register and create profiles, providing essential information on blood type, availability, and willingness to donate. Intelligent algorithms match donor profiles with real-time blood demand, facilitating targeted referral notifications. The system also integrates advanced analytics tools to comprehensively analyse donor data, including tracking donation histories, identifying supply and demand trends, and generating insights into active donor demographics. These analytical capabilities empower blood banks and healthcare authorities to make informed decisions, strategize donation campaigns, and optimize resource allocation for better emergency preparedness. In summary, the E-Blood Bank System serves as a platform for connecting active blood donors with those in need, offering critical insights through data analysis to enhance the efficiency and sustainability of blood donation networks, ultimately contributing to saving lives and improving healthcare outcomes. This collaborative approach enhances coordination during emergencies and enables a swift response to fluctuating blood demands, thereby saving valuable time and potentially lives. In conclusion, the E-Blood Bank System represents a paradigm shift in blood donation management, harnessing the power of technology and data analytics to revolutionize the way blood supply is managed. By fostering a culture of continuous improvement and innovation, it promises to address the evolving challenges faced by blood banks and contribute significantly to the advancement of healthcare delivery systems worldwide.

Key Words: blood donation, demographics, active donors, analytics, sustainability, healthcare outcomes, evolving challenges, blood supply.

1.INTRODUCTION

The Dare to Donate Application marks a significant leap forward in blood donation management, focusing on crucial aspects of donor referral and comprehensive data analysis. In today's healthcare landscape, where timely access to blood units is critical, this innovative system becomes a powerful solution to boost the efficiency and effectiveness of blood donation networks. Leveraging digital technologies, the E-Blood Bank System employs an online platform to connect potential donors with real-time blood demand. The primary focus is on actively referring blood donors—individuals readily available and willing to contribute to this life-saving cause. The system, with its user-friendly interface, allows individuals to register, creating profiles that include essential information such as blood type, availability, and commitment to donation.

The heart of the E-Blood Bank System lies in its intelligent algorithms, designed to match donor profiles with the immediate needs of healthcare institutions. This facilitates prompt and targeted referral notifications, ensuring that the right donors are mobilized swiftly, thus addressing critical blood shortages efficiently. Beyond the immediate transactional nature of donor referrals, the system incorporates sophisticated analytics tools to delve into the wealth of donor data. By tracking donation histories and identifying patterns in blood supply and demand, the E-Blood Bank System offers valuable insights into the dynamics of blood donation networks. These insights empower blood banks and healthcare authorities to make informed decisions, tailor donation campaigns, and allocate resources strategically, thereby fortifying emergency preparedness.

In essence, the E-Blood Bank System represents a pivotal convergence of technology and healthcare, aiming to create a dynamic, responsive, and data-driven ecosystem that not only facilitates the seamless referral of active blood donors but also contributes to the overall enhancement and sustainability of blood donation networks.

2.Literature Review

The authors [1,] take a data-driven machine learning approach for developing a predictive E-Blood Bank management system. Their methodology involves collecting blood bank data from various sources and preprocessing it to prepare the dataset. They then leverage a Stacked Long Short-Term Memory (LSTM) algorithm to train a model on this time series data that can forecast future blood supply requirements. The LSTM model is trained on a subset of the data and evaluated on a held-out test set to tune performance. Once sufficiently accurate, the model is used to predict blood supply needs by analyzing historical data patterns. These predictions enable blood banks to proactively restock inventories. In summary, the authors collect relevant data, develop and train a tailored LSTM forecasting model, and use this model to predict future blood supply requirements to guide just-in-time inventory management for blood banks.

The authors [2,] develop an E-Blood Bank system to digitize and improve blood bank operations, particularly managing donor data and enabling online blood orders. Their methodology involves first gathering requirements through analyzing user needs, workflows, and data. They then design the system architecture and components like processes, UI wireframes, and databases using UML diagrams. The system is implemented through coding the designed elements, with a focus on features for donor/order data management, real-time stock visibility, and connecting blood banks and potential recipients. Once built, the system undergoes testing including validation against specifications and user evaluation of satisfaction. The core approach is digitizing manual elements to increase efficiency, stakeholder connectivity, and data-driven operations leveraging an end-to-end design-build-test methodology tailored for the blood bank domain.

The paper [3,] describes the development of a Web-based Blood Bank Management System (BBMS) for the Sultanah
Nur Zahirah Hospital (HSNZ) in Malaysia using the Rational Unified Process (RUP) methodology. The system was built using J2EE and includes functionality for blood stock management, displaying blood donation schedules and events, providing information about blood donation to the public, allowing donors to view their donation history and test results, managing donor profiles, and enabling doctors to request blood products. The goal is to effectively and systematically manage the hospital's blood bank through an online system that meets the requirements of the Pathology Department.

The paper [4,] proposes an e-blood bank system called "Lifeline" aimed at improving access to safe blood transfusions in Nigeria and Africa. It uses a combination of online and offline methods for communication between blood banks, donors, and recipients. Offline methods include Unstructured Supplementary Service Data (USSD), SMS, and a toll-free phone line to enable requests and queries from remote areas with limited internet connectivity. The online component is a responsive web application that serves as the central database and information system. The goal is to maximize blood safety through screening while also preventing exploitation of patients needing urgent transfusions. The system coordinates the interests of hospitals, donors, and recipients to create a sustainable blood supply chain. Overall, Lifeline adopts a model-driven approach to develop a blood bank management system leveraging both online and basic mobile phone connectivity.

3. SYSTEM REQUIREMENTS AND SPECIFICATION

3.1 Functional Requirements

Users: The system serves administrators, staff, and donors/recipients.
Browser-based Application: The system operates as a browser-based application accessible to all stakeholders.
Prediction Techniques: While blood banking might not require prediction techniques like gadget usage, the system can utilize data analytics for predicting blood demand based on historical data.
Data Utilization: Previous datasets on blood donation patterns and recipient needs are utilized for prediction and inventory management.
Algorithm: Utilizes algorithms for inventory management, blood typing, and matching donor-recipient compatibility.
Accuracy: The system aims for accuracy in inventory management, blood matching, and predicting demand.
Administrator Functionality: Administrators manage user accounts, donor information, and oversee the system's operations.

3.2 Non-Functional Requirements

Availability: The system operates 24/7 to ensure blood is available whenever needed.
Reliability: Ensures the system functions reliably to meet critical blood transfusion requirements.
Scalability: Can handle fluctuations in blood supply and demand without compromising performance.
Security: Ensures strict access controls and data encryption to protect donor and recipient information.
Performance: Must perform efficiently, especially during emergencies, to facilitate quick blood transfusions.
Quality of Service: Regular updates and maintenance ensure the system operates smoothly and meets regulatory standards.

3.3 Software Requirements

Operating System	Windows 10 Or More
Tools	Dart (Flutter)
Runtime latform	Web Browser (Chrome)
Architecture	2bit or more

Table-1: Software Requirements

3.3 Hardware Requirements

Processor	Multi-core processors
RAM	6GB - 64GB
Storage	SD or HDD

Table-2: Hardware Requirements

4.Proposed E-Blood Bank Methodology for "JAYADEVA Hospital Mysuru"

4.1 Tier 1 - Frontend Patient/Donor Portal:

The Front-end Patient/Donor Portal constitutes the user interface that directly interacts with blood donors and potential recipients. It serves as the entry point for individuals looking to engage with the E-Blood Bank System.
Key features of this tier include:
1.User Registration and Profiles:
-Registration Process: A seamless and user-friendly registration process for donors and potential recipients.
- User Profiles: Donors can create profiles containing essential information such as blood type, contact details, and availability for donation.
2.Donor Search and Matching:
-Search Functionality: A search feature to allow blood banks and recipients to find potential donors based on criteria such as blood type, location, and availability.
-Matching Algorithms: Intelligent algorithms that match donor profiles with real-time blood demand, facilitating timely and targeted donor referrals.
3.Notifications and Alerts:
- Referral Notifications: Instant notifications sent to donor's when their blood type matches a current demand, encouraging prompt response.
- Emergency Alerts: Broadcasting urgent alerts during critical shortages or emergencies to mobilize donors quickly.

4.2 Tier 2 - Backend Blood Bank Inventory/Analytics Engine:

The Back-end Blood Bank Inventory/Analytics Engine is the core of the E-Blood Bank System, handling data management, analytics, and the orchestration of blood bank operations.
Key features of this tier include:

1.Donor Data Management:
-Database: Centralized storage for donor profiles, maintaining a secure and scalable database.
2.Blood Bank Inventory Management:
-Real-time Inventory Tracking: Monitoring blood stocks in real-time, ensuring accurate and up-to-date information on available blood units.
-Expiration Alerts: Automatic alerts for blood units approaching expiration, optimizing inventory usage.

4.3 Tier 3 – Database

Creating a SQL table for patient data involves defining the table structure, specifying data types, and establishing relationships between different attributes. It's important to consider indexing, normalization, and other database design principles based on the complexity and relationships within your healthcare system.

Based on sec. 4.1, 4.2 & 4.3 we have designed the following order of process for the proposed system.

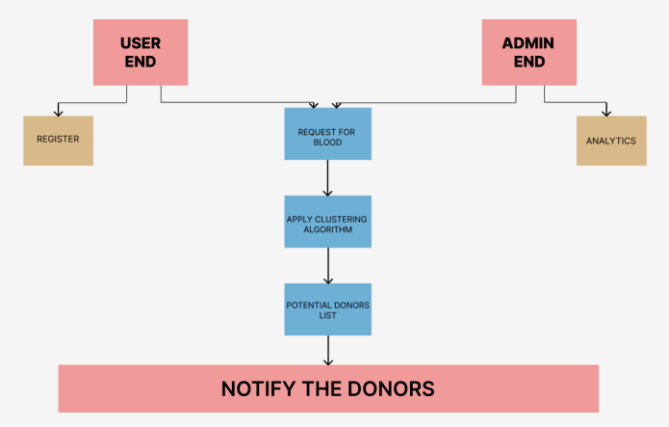

Fig-1: Order of Process

5.System Design

5.1 Use Case Diagram

Components:
1. Use Cases: Represented as horizontal ellipses, use cases describe sequences of actions that provide tangible value to an actor. Each use case captures a specific functionality or feature offered by the system.
2. Actors: Actors are depicted as stick figures and represent the various entities that interact with the system. Actors can be individuals, organizations, or external systems that engage with the system to accomplish tasks or goals.
3. System Boundary Boxes: A rectangular boundary encloses the use cases, defining the scope of the system. Anything within this boundary represents functionalities that are in scope, while anything outside is considered out of scope for the system.

5.1.1 Donor

The website is useful not only for the receiver end but also for the donor end. unlike the traditional way where one has to physically go to the blood bank register himself and carry out the formalities there, the donor can register himself with the online portal to the nearest blood bank available and schedule a date for donating blood voluntarily, this not only will save his/her time in case of emergency but will also provide the user with peace of mind. Since the donor is registered to the blood bank the donor could be directly reached by the blood bank in case of absolute emergency. The personal data of the donor will not be made public and cannot be accessed by the receiver directly but will be stored in that particular blood bank database thereby not violating his/her privacy. the personal data of the donor will not be made public and cannot be accessed by the receiver directly but will be stored in that

particular blood bank database thereby not violating his/her privacy

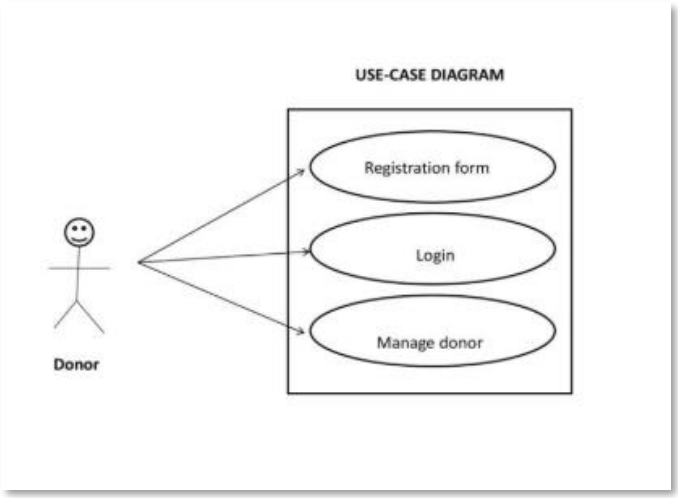

Fig-2: Donor Use-case-diagram

5.1.2 Admin

The Admin section contains all edits like manage blood bank, manage donor, manage request. He can also change donor details, delete donor or change password. There is also one additional feature of admin panel and that is status button. The Status button is used to hide or delete the status of blood bank. If blood bank is facing some technical issue so admin can hide the blood bank from database for some time. So that user don't get confused. After the problem solved the admin can easily enable the status button.

- Manage blood request
- Manage blood donor
- Manage blood bank
- Delete donor details
- Admin maintains security of the system
- Logout

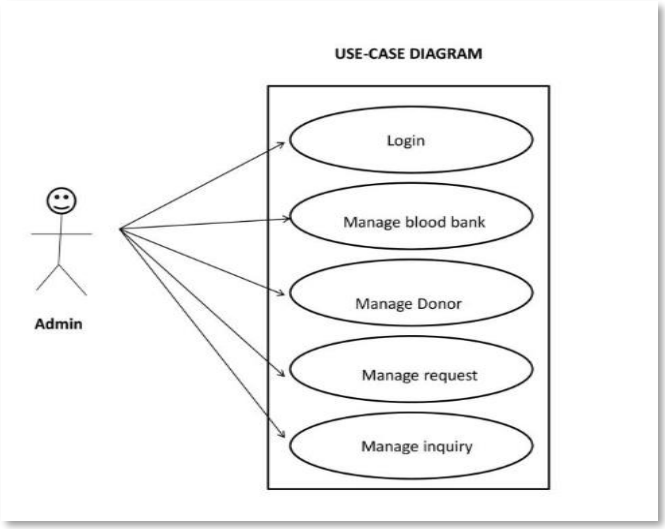

Fig-3: Admin Use-case-diagram

5.1.3 Receiver

The receiver module helps user to find blood group. When user (receiver) click on find a blood group system ask him to enter blood group he want to search. After entering the blood group, system search for the availability of the blood group and give him the list of the blood banks where the blood is available. The user will select a suitable blood bank and will issue blood.

- Find a donor
- Refer a friend via social media app
- Find a blood group
- Logout

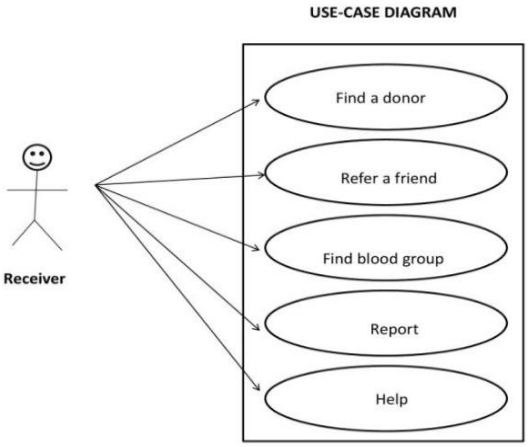

Fig-4: Receiver Use-case-diagram

6. System Implementation

The implementation of the E-Blood Bank System leverages object-oriented programming (OOP) principles within the Flutter framework to facilitate efficient development and maintenance. Object-oriented programming emphasizes data encapsulation and modularization, allowing for organized and scalable codebases.

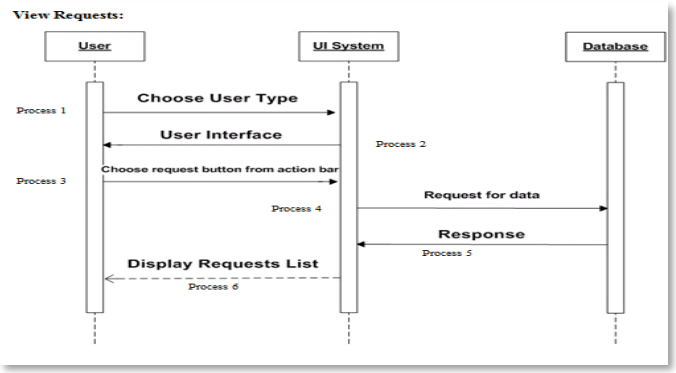

Fig-5: Sequence Diagram

TC#	Description	Expected Result	Actual Result	Status of Execution Pass/Fail
TC01	Execute/run the application	Application should run Without any interrupts.	Application is executing properly	Pass
TC02	Verification of Admin Login Input User Name and Password then click on Login button.	Admin User Name & Password should be check/verify with database	Admin User Name & Password successfully checked with database.	Pass
TC03	Verification of Input User Name & Password of Admin.	If Admin User Name & Password is valid then it should Navigate to respective Admin home page.	Admin User Name & Password is valid then successfully navigating	Pass
TC04	Verification of Input User Name & Password of Admin. (Invalid Case)	If Admin User Name & Password is invalid then show message That Input Username & Password is wrong.	If User Name & Password is not valid or wrong input then message box shown that User Name & Password wrong	Pass

Table-3: Test Cases

7. Result analysis

7.1 Login Page

The Blood Bank Login Page Application provides secure access for blood bank staff to manage donor records, inventory, and distribution. It ensures confidentiality of sensitive data while streamlining blood donation processes. With user-friendly interface and robust authentication measures, it enhances efficiency and accuracy in blood bank operations.

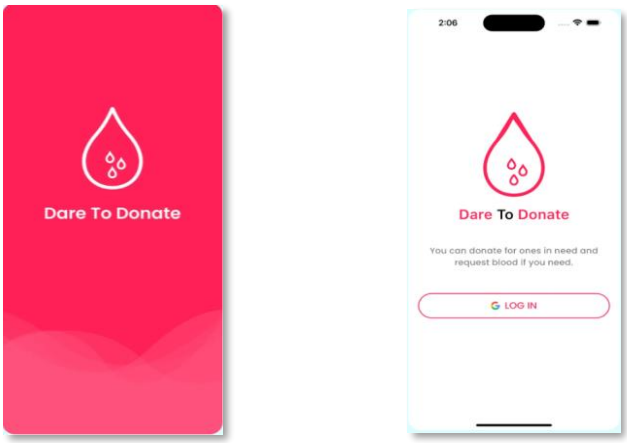

Fig-6: Login Page

7.2 Register Page

The Blood Bank Register Page Application facilitates seamless registration for blood donors, enabling them to contribute to lifesaving efforts. It ensures data accuracy and privacy through encrypted information storage and stringent verification protocols. With intuitive design and accessibility features, it encourages community involvement in blood donation initiatives.

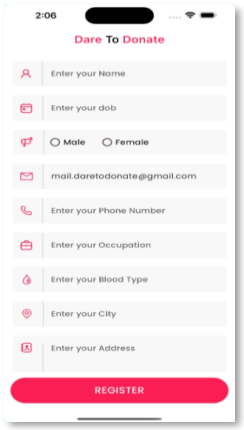

Fig-7: Register Page

7.3 Home Page

The Blood Bank Home Page Application serves as a central hub for accessing vital information about blood donation services and initiatives. It provides users with easy navigation to learn about upcoming events, donation eligibility criteria, and urgent blood needs. With interactive features and real-time updates, it fosters community engagement and encourages participation in lifesaving donations.

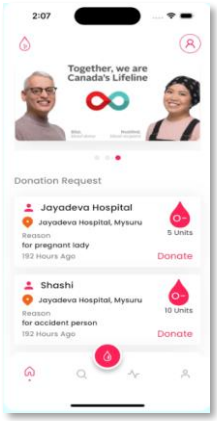

Fig-8: Home Page

7.4 Request Page

The Blood Bank Request Page Application empowers medical professionals to swiftly request blood products tailored to patient requirements. It streamlines the process by allowing detailed specifications such as blood type and quantity needed. With its user-friendly interface and prompt response system, it ensures timely access to lifesaving blood supplies.

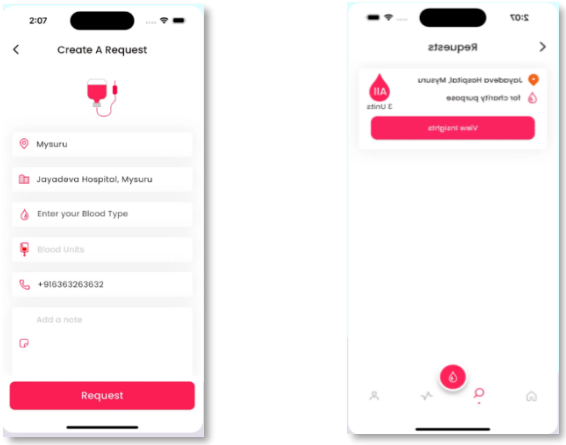

Fig-9: Request Page

7.5 Campaign Page

The Blood Bank Campaigns Page Application provides a platform to showcase ongoing and upcoming donation drives and awareness campaigns. It engages the community by highlighting opportunities to participate, donate, or volunteer for various initiatives. With interactive features and easy navigation, it fosters involvement and support for critical blood donation efforts.

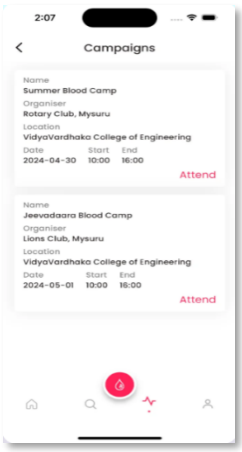

Fig-10: Campaign Page

7.6 My Profile Page

The Blood Bank My Profile Page Application offers donors and staff a personalized space to manage and update their information securely. It allows users to track their donation history, update contact details, and view eligibility status conveniently. With robust privacy measures and intuitive interface, it enhances user control and engagement within the blood bank ecosystem.

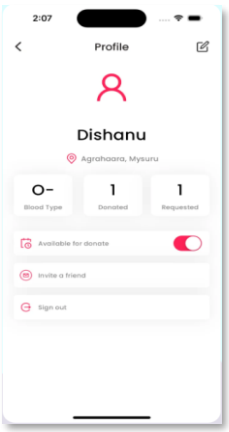

Fig-11: Profile Page

7.7 Admin Login Page

The Blood Bank Admin Login Page provides authorized personnel with secure access to administrative functions. It ensures streamlined management of donor records, inventory, and staff accounts. With stringent authentication measures and encrypted data storage, it maintains confidentiality and integrity of sensitive information.

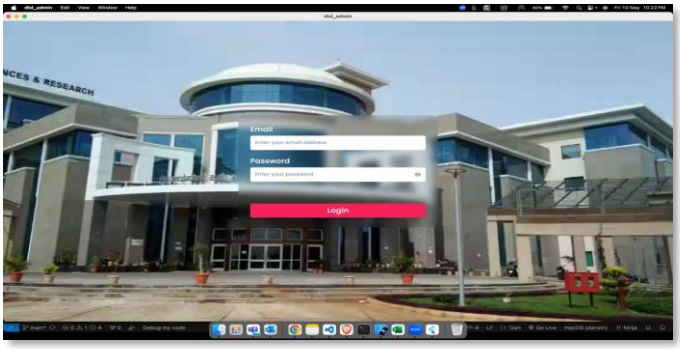

Fig-12: Admin Login Page

7.8 Admin Dashboard Page

The Blood Bank Admin Dashboard Page offers comprehensive insights and controls for managing blood bank operations efficiently. It provides real-time data on donor activity, inventory levels, and distribution logistics. With customizable features and intuitive interface, it empowers administrators to make informed decisions and optimize workflows effectively.

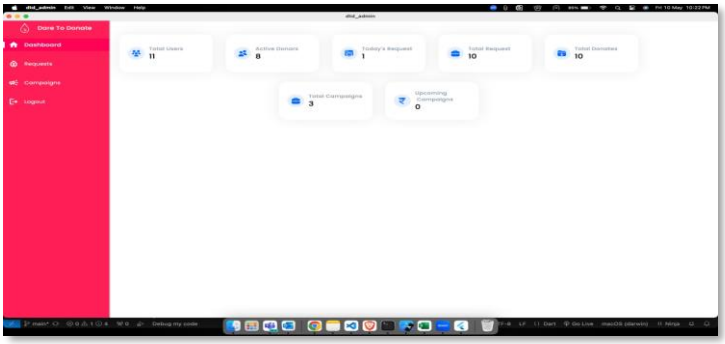

Fig-13: Admin Dashboard Page

7.9 Admin Request Page

The Blood Bank Admin Request Page facilitates efficient handling of requests for blood products and supplies from healthcare facilities. It centralizes communication, allowing administrators to review, prioritize, and fulfill requests promptly. With streamlined processes and tracking capabilities, it ensures timely responses to urgent patient needs.

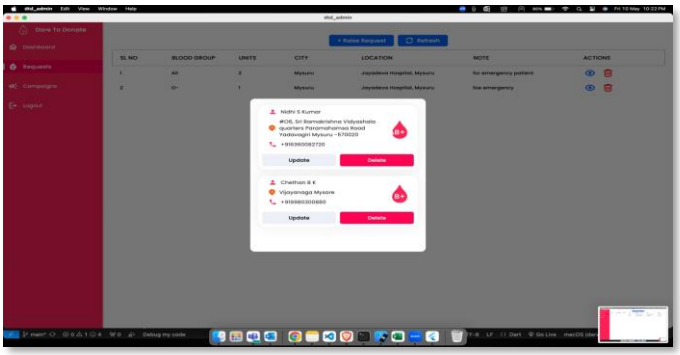

Fig-14: Admin Request Page

7.10 Admin Campaigns Page

The Blood Bank Admin Campaigns Page empowers administrators to organize and manage blood donation campaigns effectively. It facilitates the creation, monitoring, and promotion of donation drives and awareness initiatives. With tools for tracking participation and engagement, it enhances the success and impact of blood donation campaigns.

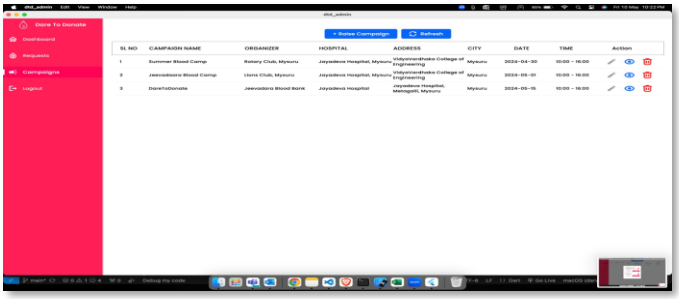

Fig-15: Admin Campaign Page

8. Application URL

https://daretodonate.in/

9. CONCLUSIONS

In conclusion, the E-Blood Bank System, centers around the referral of active blood donors and in-depth analysis of donor data, emerges as a transformative solution in the realm of blood donation management. By leveraging an innovative online platform, this system streamlines the connection between donors and recipients, ensuring a timely and targeted referral process. The integration of intelligent algorithms facilitates swift donor mobilization, addressing critical blood shortages efficiently. Simultaneously, the system's analytics engine provides a wealth of insights into donor behaviors, enabling blood banks to make informed decisions, optimize campaigns, and enhance emergency preparedness. In essence, the E-Blood Bank System not only serves as a dynamic bridge between donors and recipients but also represents a data-driven approach that strengthens the resilience and sustainability of blood donation networks, ultimately contributing to improved healthcare outcomes and the well-being of communities by following the aspects of Fig -1.

ACKNOWLEDGEMENT

We would like to express our sincere gratitude to the Blood Bank Department and the Management of Jayadeva Hospital, Mysuru, for their invaluable support and cooperation throughout the development of the E-Blood Bank System model. Their willingness to share essential information and insights has been instrumental in shaping the robust framework of our system. Their dedication to the cause of blood donation and healthcare has significantly contributed to the success of our project. We extend our heartfelt thanks to the entire team for their generosity and commitment, as their contributions have been pivotal in realizing the vision of an efficient and effective E-Blood Bank System.

REFERENCES

1. Mr. Nayan Chordiya, Mr. Pushpak Fegade, Mr. Deep Bhagat, Mrs. Mrunali Desai, “E-Blood Bank Analysis using Machine Learning”.
2. Lilik Sumaryanti, Suwarjono, Lusia Lamalewa, Atlantis Highlights in Engineering (AHE), volume 1, International Conference on Science and Technology (ICST 2018): “E-Blood Bank Application for Organizing and Ordering the Blood Donation”.
3. Sumazly Sulaimana, Abdul Aziz K. Abdul Hamida, Nurul Ain Najihah Yusria, Procedia - Social and Behavioral Sciences 195 (2015) 2008 – 2013, World Conference on Technology, Innovation and Entrepreneurship: “Development of a Blood Bank Management System”.
4. Lukman Ismaila, Umar Adam Ibrahim, Conference Paper · December 2019: “The Prospect and Significance of Lifeline: An E-blood bank System”.