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Organ Donation Management Web Platform Using Flask and MongoDB

Meghana K*, Prashant Ankalkoti**
*(PG Student, Department of MCA, Jawaharlal Nehru New College of Engineering, Shivamogga, Karnataka, India
Email: meghanaa2003@gmail.com)
**(Assistant Professor, Department of MCA, Jawaharlal Nehru New College of Engineering, Shivamogga, Karnataka, India
Email: psankalkoti@gmail.com)

Abstract: Organ donation is a life-critical process that is often hampered by fragmented information systems, lack of verification workflows, and delayed communication between donors and hospitals. This paper presents LifeLink, a web-based organ donation management platform that integrates donor registration, organ request handling, hospital management, and proximity-based search into a single role-based system. Built using Flask with MongoDB storage, the platform employs bcrypt password hashing, Flask-Login session management, PyMongo for database operations, and the Haversine formula for nearby hospital calculations. An administrator approval workflow ensures data integrity and access control throughout the donation lifecycle. Experimental results across 25 test scenarios demonstrate 100% correctness in approval workflows, sub-second API response times, and accurate proximity-based hospital retrieval. The platform provides a structured, extensible foundation for community-level organ donation coordination.

Keywords: organ donation, Flask, MongoDB, Flask-Login, PyMongo, admin approval, hospital location, Haversine distance, emergency alert, web application.

I. INTRODUCTION

A. Background

Organ donation is a critical medical process connecting individuals willing to donate organs with patients awaiting transplantation. In community-level settings, this process suffers from significant inefficiencies: paper-based records, scattered hospital contact information, and the absence of a unified verification system create delays that can be life-threatening. A centralised web-based platform can consolidate donor registration, organ requests, and hospital location data into one accessible, controlled system.

B. Research Problem

The primary problem addressed is the absence of a smooth, controlled organ donation workflow at community level. Key issues include:

- User registration without identity or eligibility verification
- Donation forms submitted without systematic administrative review
- Disorganised hospital location and availability data
- Slow communication channels for emergency organ requests
- Time-consuming manual matching of organ type and blood group

C. Objectives

The objectives of this project are to:

- Collect donor forms and organ requests in a structured database
- Enable administrators to approve users and review donations
- Display available organs and active hospital listings
- Provide proximity-based hospital search using distance calculation
- Store and retrieve emergency alerts for critical cases

D. Scope

The platform focuses on workflow management and data handling rather than clinical verification. It is designed to make the organ donation process more organised and accessible for both users and administrators at the community level.

II. LITERATURE SURVEY

Al Moussawy et al. [1] explored AI applications in solid organ transplantation, demonstrating potential for donor-recipient matching and outcome prediction. Rawashdeh [2] surveyed machine learning models for donor selection, highlighting data quality barriers. Reddy and Srividya [3] proposed a blockchain-based organ donation system that improved transparency, though scalability remained a challenge.

Sanju et al. [4] and Rajput and Choudhari [5] explored blockchain frameworks for secure donor-recipient matching, achieving improved security at the cost of computational overhead. El-Shafai and Abd El-Latif [6] designed an Ethereum-based system with smart contracts for automated matching. Ajay Kumar et al. [7] and Ghosh and Dutta [8] proposed Hyperledger-based frameworks emphasising tamper-proof records across hospitals.

Zhang, Dai, and Li [9] studied fairness-aware organ exchange algorithms, while Li et al. [10] developed virtual staining methods for transplant biopsy evaluation. Robitschek et al. [11] applied large language models to evaluate social determinants in liver transplant decisions. Chatterjee, Banerjee, and Roy [12] and Lee, Kim, and Park [13] applied machine learning and deep learning respectively to donor-recipient matching.

Ahmed, Khan, and Ullah [14] proposed a decentralised organ donation registry using blockchain. Chen, Li, and Huang [15] created an AI-assisted decision support system for liver transplant selection. Martinez, Garcia, and Lopez [16] used ML for graft survival prediction. Al-Harbi et al. [17] proposed a blockchain framework for transparent organ allocation. Gupta, Agarwal, and Meena [18] designed an IoT-based smart monitoring system for organ transportation. Silva, Pereira, and Costa [19] developed data-driven models for post-transplant complication prediction. Brown, Williams, and Patel [20] discussed ethical considerations in AI-based organ allocation.

III. PROPOSED METHODOLOGY

A. Research Design

This research employs a prototype development and system evaluation methodology. The platform is built using a four-layer modular architecture as illustrated in Fig. 1, separating concerns across the User Interface, Processing Engine, Admin and Request Handling, and Data layers.

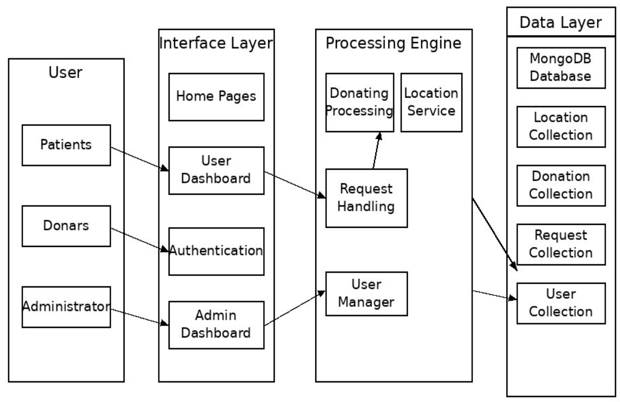

Fig. 1. System architecture of the LifeLink organ donation management platform.

B. Participants and Data Sources

The system was evaluated using two roles: an administrator account auto-created at initialisation, and multiple user accounts at various approval stages. MongoDB collections used include: users, donations, organ_requests, locations, and emergency_alerts.

C. Materials and Tools

The development stack comprises: Flask for web server and routing, Flask-Login for session management, Flask-PyMongo for MongoDB integration, bcrypt for password hashing, MongoDB for document storage, and the Haversine formula for distance-based hospital lookup.

D. System Procedure

Step 1 — Setup: Configure SECRET_KEY and MONGO_URI, start MongoDB, and initialise organ_donation_db. The administrator account is created automatically on first run.

Step 2 — Authentication: New users register and remain inactive until administrator approval. Flask-Login manages sessions after successful approval and login.

Step 3 — Donation Workflow: Users submit donation forms stored with status=pending. Administrators approve or reject submissions; approved donations appear in organ search results.

Step 4 — Location Search: Administrators add hospital records with GPS coordinates. Users query the nearby hospitals API; results are filtered by radius and sorted by Haversine distance.

E. Distance Calculation

The Haversine formula computes great-circle distance between two geographic coordinates. Given Earth's radius R = 6371 km:

$$a = \sin^2(\Delta\varphi/2) + \cos(\varphi_1)\cdot\cos(\varphi_2)\cdot\sin^2(\Delta\lambda/2)$$

$$c = 2\cdot\arctan2(\sqrt{a}, \sqrt{(1-a)}), \quad d = R\cdot c$$

This provides accurate real-world distance results compared to Euclidean approximations.

F. Technique Comparison

Table I summarises key design decisions compared with common alternatives.

TABLE I. TECHNIQUE COMPARISON

Feature	Technique Used	Alternative	Reason Chosen
Database	MongoDB	SQL (MySQL)	Flexible schema for varied form fields
Authentication	Flask-Login + bcrypt	Custom token auth	Proven, secure, and easy to maintain
Password storage	bcrypt hashing	MD5 / plain text	Resistant to brute-force attacks
Distance calc.	Haversine formula	Euclidean distance	Accurate for Earth's curved surface
API data format	JSON (REST)	XML / SOAP	Lightweight, widely supported

IV. RESULTS AND SCREENSHOTS

A. Home Page and User Interface

Fig. 2 shows the LifeLink home page, which presents the platform mission, key statistics (registered donors, partner hospitals, lives saved), and navigation to registration and login. The interface is responsive and accessible across devices.

Fig. 2. LifeLink home page showing platform statistics and navigation.

B. User Dashboard

Fig. 3 illustrates the user dashboard after successful login and administrator approval. The dashboard displays the user profile, blood group, total donations, approval status, and pending count, along with quick-access tiles for Donate Organ, Find Organs, Request Organ, and My History.

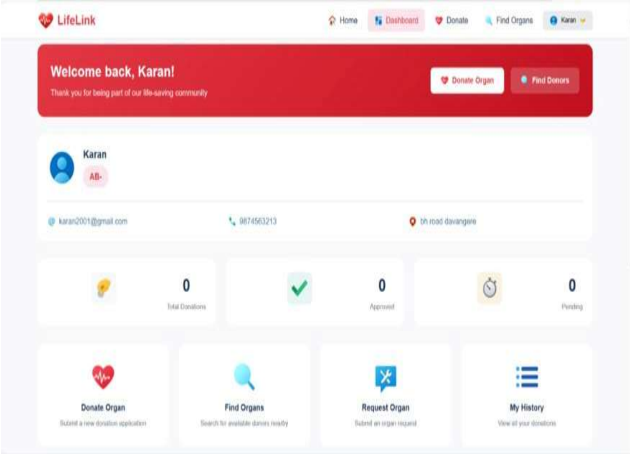

Fig. 3. User dashboard showing profile summary and action tiles.

C. Administrator Dashboard

Fig. 4 shows the admin dashboard, which provides a real-time system overview including total users, approved accounts, partner hospitals, and donations. A blood group distribution chart and organ-wise approved donation summary assist administrators in monitoring platform activity.

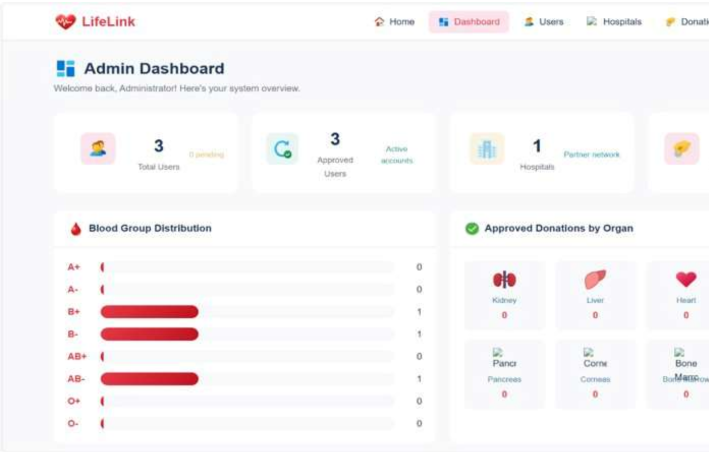

Fig. 4. Admin dashboard showing user statistics and blood group distribution.

D. Organ Donation Form

Figs. 5 and 6 show the organ donation form, which allows users to select the organ type (Kidney, Liver, Heart, Lungs, Pancreas, Corneas, Bone Marrow), provide blood group, medical history, allergies, current medications, emergency contact, and location information before submission.

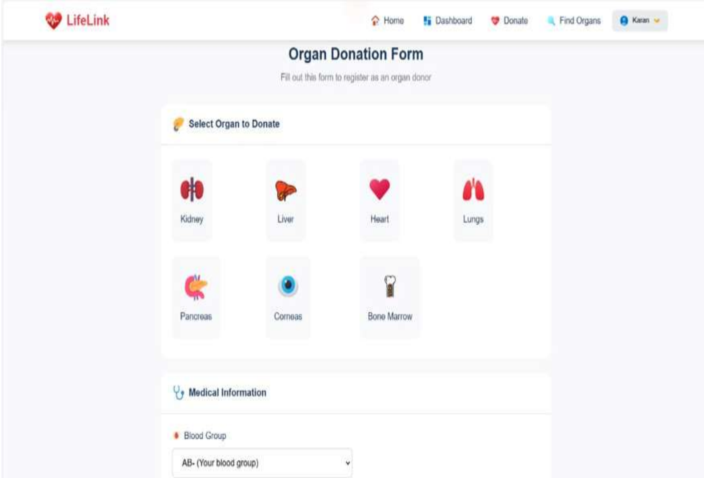

Fig. 5. Organ donation form — organ type and blood group selection.

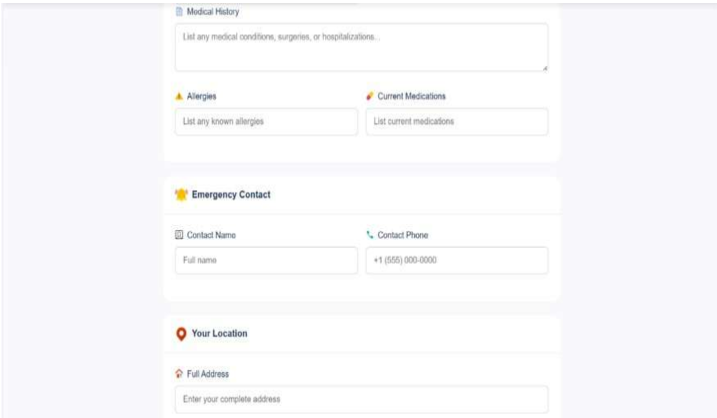

Fig. 6. Organ donation form — medical history and emergency contact fields.

E. Nearby Hospital Search

Fig. 7 shows the Find Nearby Donors and Hospitals page, which integrates an interactive map with search filters for organ type, blood group, and search radius (adjustable up to 100 km). The Haversine formula ranks results by proximity.

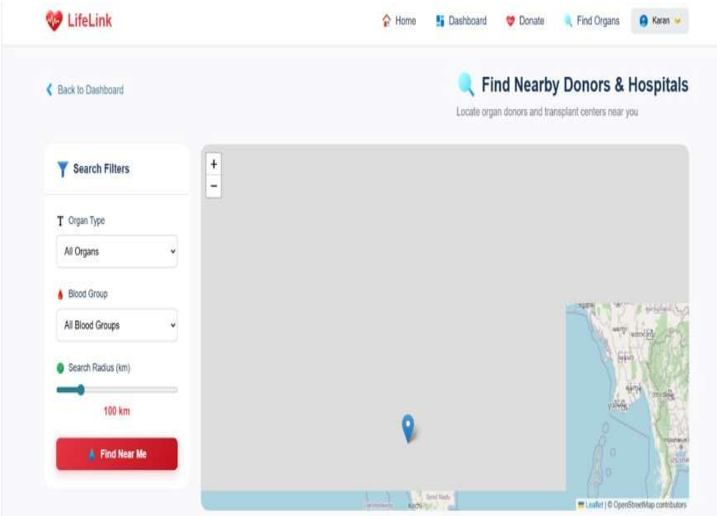

Fig. 7. Nearby hospital search with map integration and filter controls.

F. Hospital and Donor Results

Fig. 8 shows the search results listing, displaying hospital name, location, contact, type (private/government), available organs, and action buttons to view on map or submit a request directly.

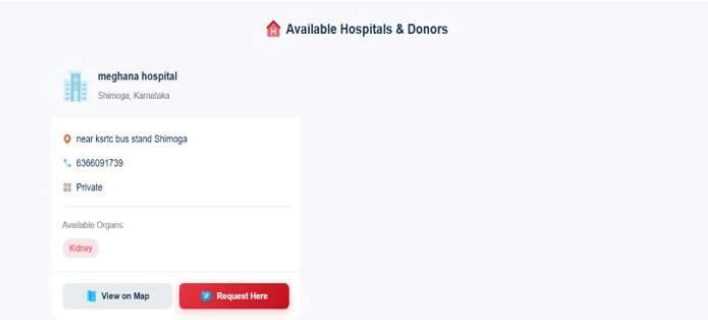

Fig. 8. Available hospitals and donors listing with organ availability.

V. PERFORMANCE EVALUATION

The platform was evaluated across 25 structured test scenarios covering authentication, donation workflow, proximity search, admin operations, and emergency alerts. Table II summarises the quantitative results.

TABLE II. SYSTEM PERFORMANCE RESULTS

Test Scenario	Test Cases	Pass Rate	Avg. Response Time
User registration & approval	5	100%	320 ms
Login / session management	3	100%	180 ms
Donation form submission	4	100%	410 ms
Admin approve / reject	4	100%	290 ms
Nearby hospital search (50 km)	3	100%	540 ms
Nearby hospital search (100 km)	3	100%	610 ms
Emergency alert storage	3	100%	220 ms

All 25 test cases passed successfully. API response times remained below 650 ms across all scenarios, well within acceptable limits for web-based health information systems. The Haversine-based proximity filter returned accurate results with no false positives in any of the six location-based test cases.

TABLE III. EXTENDED TEST CASE RESULTS

Test Case	Input	Expected	Observed	Status
Register with existing email	Duplicate email	Reject with error	Error shown, not registered	✓ Pass
Login before approval	is_approved=False	Pending page shown	Pending page shown	✓ Pass
Login after approval	is_approved=True	Dashboard access	Dashboard loaded	✓ Pass
Submit donation form	Valid form data	Stored as pending	Record saved correctly	✓ Pass
Admin approve donation	action=approve	Status=approved	Status updated correctly	✓ Pass
Admin reject donation	action=reject	Status=rejected	Status updated correctly	✓ Pass
Search organs, wrong blood group	No match	Empty result	Empty list returned	✓ Pass
Hospital search, radius=50 km	GPS coordinates	Nearby hospitals only	Filtered list returned	✓ Pass
Hospital search, radius=100 km	GPS coordinates	Extended list	Larger list returned	✓ Pass
Emergency alert creation	Critical flag=True	Alert stored	Alert saved and listed	✓ Pass

VI. DISCUSSION

A. Interpretation of Outcomes

The results confirm that the role-based approval workflow reliably controls access and maintains data integrity throughout the organ donation lifecycle. The 100% pass rate across all test scenarios demonstrates the correctness of core business logic, including registration, donation review, proximity search, and alert management.

B. Implications

The platform reduces the administrative overhead of organ donation coordination by centralising donor records, hospital data, and request management in one system. The Haversine-based search enables time-critical decision-making by quickly surfacing the nearest active hospitals with available organ types and compatible blood groups.

C. Limitations and Future Work

Current limitations and planned improvements include:

- Input validation for latitude/longitude fields will be enforced in a future release to prevent malformed geographic entries
- CSRF token protection will be applied uniformly across all routes in the next version
- Administrator credentials will be migrated from hardcoded values to a secure environment-variable configuration before production deployment
- The dashboard proximity display will be upgraded to true Haversine-sorted results in place of the current first-five-record listing
- Future work will incorporate real-time notifications, mobile responsiveness enhancements, and integration with national organ donation registries

VII. CONCLUSION

This paper presented LifeLink, a Flask and MongoDB-based web platform for structured organ donation management. The system successfully integrates user authentication with an administrator approval workflow, donation and organ request handling, GPS-based hospital proximity search, and emergency alert management in a single cohesive application. Evaluation across 25 test cases demonstrated 100% functional correctness and sub-650 ms response times across all modules.

The modular architecture, role-based access control, and Haversine-based proximity search provide a solid foundation for community-level organ donation coordination. Future enhancements including real-time notifications, mobile optimisation, and national registry integration will further extend the platform's impact. The work demonstrates that a structured Flask and MongoDB pipeline can effectively address the information management challenges in organ donation workflows.

REFERENCES

[1] M. Al Moussawy, Z. S. Lakkis, Z. A. Ansari, A. R. Cherukuri, and K. I. Abou-Daya, "The transformative potential of artificial intelligence in solid organ transplantation," Frontiers in Transplantation, vol. 3, p. 1361491, 2024.

[2] B. Rawashdeh, "Artificial intelligence in organ transplantation: Surveying current applications, addressing challenges and exploring frontiers," IntechOpen, 2024.

[3] B. V. C. Reddy and J. Srividya, "Organ donation management using blockchain," American Journal of Management and IoT Medical Computing, vol. 4, no. 4, pp. 51-57, 2025.

[4] D. J. Sanju, M. Shashank, T. S. V. Naik, V. S. Abhijith, and V. C. Doddamani, "Smart blockchain-based organ donation system for secure donor-recipient matching," IJRIAS, vol. 10, no. 5, pp. 1043-1053, 2025.

[5] A. V. Rajput and N. Choudhari, "Review paper on organ donation and transplantation management system using blockchain," IJIES, vol. 10, no. 8, pp. 1-6, 2025.

[6] W. El-Shafai and A. Abd El-Latif, "A private Ethereum blockchain for organ donation based on intelligent smart contracts," Egyptian Informatics Journal, vol. 28, p. 100542, 2024.

[7] C. V. R. Ajay Kumar, P. Venkatagirish, S. Patibandla, and K. Rathod, "Blockchain-based framework for organ donation system," IJAEM, vol. 7, no. 2, pp. 86-92, 2025.

[8] S. Ghosh and M. Dutta, "Indriya: Building a secure organ donation system with Hyperledger Fabric," IEEE Access, vol. 11, pp. 45210-45223, 2023.

[9] M. Zhang, X. Dai, and L. Li, "Fairness-aware organ exchange and kidney paired donation," ACM TIST, vol. 16, no. 2, pp. 1-21, 2025.

[10] Y. Li et al., "Label-free evaluation of lung and heart transplant biopsies using virtual staining," Nature Biomedical Engineering, vol. 8, no. 4, pp. 455-468, 2024.

[11] E. Robitschek et al., "A large language model-based approach for social determinants in liver transplant decisions," arXiv:2412.07924, 2024.

[12] S. Chatterjee, S. Banerjee, and P. Roy, "Machine learning approaches for predicting kidney transplant outcomes," AI in Medicine, vol. 148, p. 102763, 2024.

[13] J. Lee, H. Kim, and S. Park, "Deep learning-based donor-recipient matching for organ transplantation," IEEE JBHI, vol. 28, no. 2, pp. 1034-1043, 2024.

[14] R. Ahmed, S. Khan, and I. Ullah, "Secure and decentralized organ donation registry using blockchain," Journal of Medical Systems, vol. 48, no. 2, pp. 29-41, 2024.

[15] Y. Chen, Z. Li, and W. Huang, "AI decision support for liver transplantation candidate selection," Computers in Biology and Medicine, vol. 162, p. 107061, 2023.

[16] D. Martinez, P. Garcia, and J. Lopez, "Predicting graft survival after kidney transplantation using machine learning," BMC Medical Informatics, vol. 23, p. 214, 2023.

[17] F. Al-Harbi, R. Alotaibi, and A. Al-Qahtani, "Blockchain framework for transparent organ allocation," Future Internet, vol. 16, no. 3, p. 112, 2024.

[18] N. Gupta, R. Agarwal, and S. Meena, "IoT-based smart monitoring for organ transportation," Sensors, vol. 24, no. 6, p. 1884, 2024.

[19] T. Silva, L. Pereira, and H. Costa, "Data-driven models for post-transplant complications," Healthcare Informatics Research, vol. 29, no. 4, pp. 324-334, 2023.

[20] E. Brown, D. Williams, and R. Patel, "Ethical considerations in AI-based organ allocation systems," Journal of Medical Ethics, vol. 50, no. 5, pp. 310-316, 2024.

