International Journal of Web of Multidisciplinary Studies
( Peer-Reviewed, Open Access, Fully Refereed International Journal )
website: https://ijwos.com
Volume 3 Issue 6 , June 2026
E-ISSN : 3049-2424
DOI: https://doi.org/10.71366/ijwos

# AI-ENABLED ORGAN DONATION AND TRANSPLANT MATCHING SYSTEM

C.GANESH[1], NIVASHINI.U[2]
[1] *Assistant Professor Master of Computer Applications, Vivekananda Institute of Information and Management Studies, Tiruchengode*
[2] *Vivekananda Institute of Information and Management Studies, Tiruchengode*

***Article Info***

***Article History:***

*Published: 28 June 2026*

***Publication Issue:***
*Volume 3, Issue 6*
*June-2026*

***Page Number:***
*412-418*

***Corresponding Author:***
*NIVASHINI.U*

***Abstract:***

Organ donation plays a vital role in modern healthcare by providing life-saving treatment to patients suffering from organ failure. The success of transplantation depends on timely organ availability and accurate matching between donors and recipients. However, traditional organ allocation systems face several challenges such as fragmented medical records, manual coordination, and communication delays. These limitations reduce the efficiency and effectiveness of transplant decisions.

To address these issues, this research proposes an AI-enabled organ donation and transplant matching system. The system integrates intelligent automation with a user-friendly digital platform to improve the overall process. It allows secure donor registration and hospital organ requests through authenticated access. All medical and demographic data are stored in a centralized database for easy management.

The system uses the Random Forest algorithm to determine organ compatibility. It analyzes multiple parameters such as blood group, tissue type, age, medical urgency, geographic distance, and patient history. Based on this analysis, the system generates compatibility scores and ranks the most suitable donor–recipient pairs. This improves matching accuracy and reduces the chances of errors.

In addition, an AI chatbot is integrated into the platform to assist users. It provides information about organ donation procedures, eligibility criteria, and registration steps. The chatbot also helps users track application status and reduces administrative workload.The system further includes real-time notifications, role-based access control, and monitoring features. These components improve communication and ensure data security. Overall, the proposed system enhances efficiency, transparency, and reliability in organ donation management.

***Keywords:*** AI-ENABLED, AI chatbot

## 1. Introduction

Organ transplantation is one of the most important medical procedures used to save the lives of patients suffering from organ failure. It provides a second chance for individuals whose organs are no longer functioning properly. The success of transplantation largely depends on the timely availability of organs and accurate matching between donors and recipients. Without proper coordination, many patients may not receive organs at the right time.

The process of organ donation and allocation is complex and involves multiple stakeholders such as hospitals, donors, recipients, and regulatory authorities. Each of these entities plays a crucial role in ensuring successful transplantation. However, coordinating between them can be difficult due to differences in systems and procedures.

Traditional organ donation systems rely heavily on manual processes and disconnected databases. These systems often lack proper integration, which makes data sharing slow and inefficient. As a result, delays occur in identifying suitable donors and completing the matching process.

Poor communication between hospitals and organizations further affects the speed and reliability of organ allocation. In many cases, valuable time is lost due to administrative inefficiencies. These delays can have serious consequences for patients who urgently need transplants.

With advancements in artificial intelligence and digital technologies, there is an opportunity to improve the organ matching process. AI can analyze large amounts of medical data quickly and accurately. This research focuses on developing an AI-enabled system that enhances accuracy, speed, and accessibility in organ transplantation.

## 2. Literature Review

Several studies have explored the use of technology to improve organ donation and transplantation systems. Early approaches mainly focused on maintaining donor databases and managing basic patient information. These systems helped in data storage but did not significantly improve the matching process.

In traditional methods, organ allocation was performed manually by medical professionals based on simple criteria such as blood group and urgency level. While these methods provided basic support, they lacked efficiency and accuracy in complex cases.

Some researchers introduced rule-based systems to automate the matching process. These systems used predefined rules to identify suitable donor–recipient pairs but lacked flexibility and adaptability.

With the advancement of technology, machine learning techniques have been applied to improve organ matching. Studies by Smith [1] highlight how AI improves decision-making in healthcare systems. Kumar [2] explains the effectiveness of machine learning algorithms like Random Forest in predicting organ compatibility.

Chen [3] emphasizes the importance of centralized data systems and real-time integration for better coordination between hospitals. Gupta [4] discusses optimization techniques that improve resource allocation and system efficiency in healthcare.

Despite these advancements, many existing systems still face challenges such as lack of real-time data integration, limited automation, and inefficient communication. These limitations reduce the effectiveness of organ allocation and highlight the need for a more intelligent and integrated solution.

[1] J. Smith, “AI in Healthcare Systems,” *International Journal of Innovative Research in Technology (IJIRT)*, vol. 8, no. 3, pp. 120–125, 2022.

[2] R. Kumar, “Machine Learning in Organ Transplantation,” *International Journal of Innovative Research in Technology (IJIRT)*, vol. 9, no. 1, pp. 45–50, 2023.

[3] L. Chen, "Data-Driven Healthcare Systems," *International Journal of Innovative Research in Technology (IJIRT)*, vol. 7, no. 6, pp. 200–205, 2021.

[4] P. Gupta, "Healthcare Optimization Techniques," *International Journal of Innovative Research in Technology (IJIRT)*, vol. 8, no. 5, pp. 78–83, 2022.

## 3. Existing System

The existing organ donation system mainly relies on manual processes and involves multiple independent entities such as hospitals, donor registries, and transplant authorities. Each organization maintains its own database, which leads to a lack of proper coordination. As a result, information is often scattered and difficult to access quickly.

Donor details, including medical and demographic information, are stored in separate systems. This fragmentation makes it challenging to share data efficiently between hospitals and transplant centers. Communication between these entities is often slow and depends on manual coordination.

When a patient requires an organ transplant, hospitals search for available donors through registries or by contacting other hospitals. This process can take a significant amount of time. Matching is usually based on basic parameters such as blood group and urgency level.

However, this approach does not consider multiple important medical factors that can improve matching accuracy. The lack of advanced analytical tools limits the effectiveness of the system.

Manual handling of data increases the chances of errors and miscommunication. Delays in identifying suitable donors can reduce the chances of successful transplantation. In critical cases, even small delays can have serious consequences.

In addition, the absence of a centralized system makes it difficult to track donor availability and patient status in real time. This leads to inefficient resource utilization and poor decision-making.

Because of these limitations, many patients experience delays in receiving organ transplants, which can negatively impact survival rates. Therefore, there is a need for a more advanced and automated system.

## 4. Proposed Methodology

## 5. System Architecture

The system architecture consists of several modules that work together to provide efficient organ matching and management.

### 1. Data Collection Module:

This module collects donor and recipient information from hospitals and users. It includes medical and demographic details required for matching.

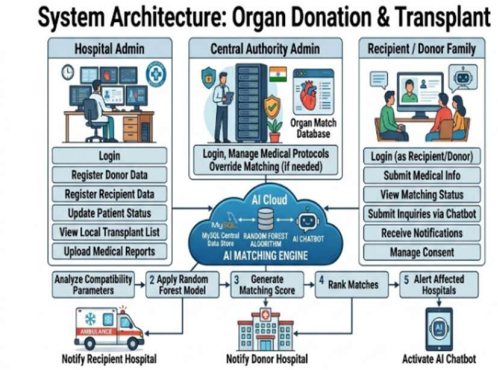
**2. Data Processing Module:** This module cleans and organizes the collected data. It ensures that the data is accurate and ready for analysis.

**3. Matching Engine:** The matching engine uses the Random Forest algorithm to analyze data and generate compatibility scores between donors and recipients.

**4. Database Module:** All data is stored in a centralized MySQL database, which ensures easy access and management.

**5. User Interface:** The frontend interface allows users, hospitals, and administrators to interact with the system.

**6. Chatbot Module:** The chatbot provides instant responses to user queries and improves communication efficiency.




## 6. Implementation

The proposed system is implemented using modern web technologies and machine learning tools to ensure efficiency and scalability. The development process focuses on creating a user-friendly and reliable platform for organ donation and matching.

The frontend of the system is developed using HTML, CSS, and JavaScript. It provides an interactive and easy-to-use interface for donors, recipients, and hospital staff. Users can register, submit requests, and view information through this interface.

The backend is implemented using Python with the Flask framework. Flask handles server-side operations, including data processing, request handling, and communication between different modules.

The core matching functionality is implemented using the Random Forest algorithm from the Scikit-learn library. This algorithm analyzes multiple medical parameters to generate compatibility scores and identify suitable matches.

Data preprocessing techniques are applied using Python libraries such as Pandas and NumPy. These tools help clean, organize, and prepare data for accurate analysis.

The system uses MySQL as the database to store donor and recipient information securely. The database ensures centralized data storage and efficient retrieval of information.

The AI chatbot is developed using Natural Language Toolkit (NLTK). It enables the system to understand user queries and provide relevant responses in real time.

Additional features such as real-time notifications and secure login mechanisms are also implemented. These features improve communication, ensure data security, and enhance the overall performance of the system.

**7. Experimental Research**

The proposed system was evaluated using sample datasets containing donor and recipient information. The dataset included various medical and demographic parameters required for organ matching. These parameters helped in analyzing the effectiveness of the system.

Key attributes such as blood group, tissue type, age, medical urgency, and patient history were considered during testing. These factors play an important role in determining compatibility between donors and recipients.

Before applying the algorithm, data preprocessing techniques were used to clean and organize the dataset. This ensured that the data used for testing was accurate and consistent.

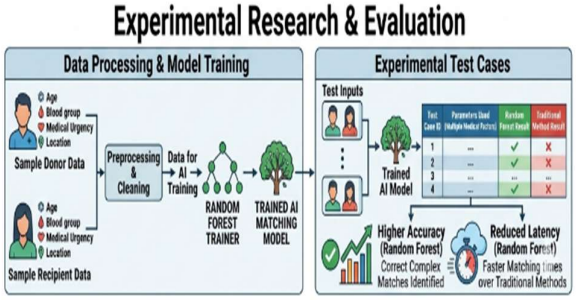
Multiple test cases were created to evaluate the performance of the system under different conditions. These test cases helped in understanding how well the system performs in real-world scenarios.

The Random Forest algorithm was used as the core model for matching. Its performance was compared with traditional rule-based and manual matching techniques.

The evaluation focused on parameters such as accuracy, matching time, and reliability. The system showed improved performance in all these aspects.

The AI-based approach was able to identify suitable donor–recipient pairs more effectively. It also reduced the time required to find matches compared to traditional methods.

Overall, the experimental results demonstrate that the proposed system provides faster, more accurate, and reliable organ matching.



## 8. Results and Discussion

The results of the proposed system demonstrate significant improvements in organ matching accuracy and efficiency. The AI-based approach using the Random Forest algorithm provides better performance compared to traditional and rule-based systems. The generated results show higher accuracy and reduced time in identifying suitable donor–recipient pairs.

The comparison chart illustrates that the AI model achieves better matching accuracy than existing methods.This improvement is mainly due to the ability of the algorithm to analyze multiple medical parameters simultaneously. As a result, the chances of incorrect matching are significantly reduced.

The centralized database and automated workflow further enhance system performance. Data can be accessed quickly, and communication between hospitals becomes more efficient. Real-time notifications also help in faster response to organ availability.

The chatbot module improves user interaction by providing instant information and reducing manual workload. This makes the system more user-friendly and accessible.

These findings are consistent with the studies discussed in the Literature Review.

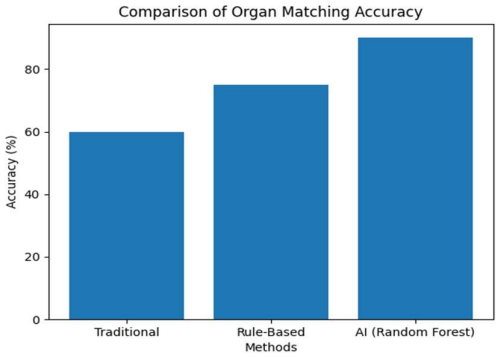
Smith highlighted the role of AI in improving decision-making in healthcare systems.

Kumar demonstrated the effectiveness of machine learning algorithms in organ transplantation.

Chen emphasized the importance of centralized data systems for better coordination, while Gupta discussed optimization techniques for improving efficiency.

The proposed system successfully addresses many limitations of existing systems, such as delays, lack of integration, and inefficiency. By combining AI, automation, and centralized data management, the system provides a reliable and effective solution.

Overall, the results confirm that the AI-enabled approach enhances accuracy, reduces processing time, and improves transparency in organ donation management.




## 9. Conclusion

Organ donation is a critical component of modern healthcare, and efficient organ allocation is essential for saving lives. Traditional systems face challenges such as delays, lack of coordination, and limited use of technology. This research proposes an AI-enabled organ donation and transplant matching system that addresses these challenges. By using machine learning techniques and a centralized platform, the system improves matching accuracy and reduces delays. The integration of automation and intelligent decision-making makes the system more effective and reliable. This approach has the potential to significantly improve organ transplantation processes.

## 10. Future Work

In the future, the system can be enhanced by integrating real-time hospital data and national organ registries. This will improve the accuracy and availability of donor information. A mobile application can be developed to allow users to register as donors and track their application status easily. The system can also include advanced machine learning algorithms to further improve matching performance. Integration with GPS and geographic data can help identify the nearest hospitals and reduce transportation time for organ delivery. These improvements will make the system more efficient, accessible, and user-friendly.

## References

1. World Health Organization,“Organ Donation and Transplantation,” WHO Guidelines, 2020.
2. United Network for Organ Sharing (UNOS),“Organ Allocation Policies and Data,” 2022.
3. National Organ and Tissue Transplant Organization (NOTTO),“National Guidelines for Organ Transplantation,” Government of India.
4. Leo Breiman,“Random Forests,” *Machine Learning Journal*, 2001.
5. Tom M. Mitchell,“Machine Learning,” McGraw-Hill Education, 1997.
6. Ian Goodfellow,“Deep Learning,” MIT Press, 2016.
7. Chen, M., Hao, Y., Hwang, K., Wang, L., Wang, L.,“Disease Prediction by Machine Learning Over Big Data,” *IEEE Access*, 2017.
8. Kaur, P., Sharma, M.,“Applications of Artificial Intelligence in Healthcare,” *International Journal of Computer Applications*, 2018.
9. Gupta, P., “Healthcare Optimization Techniques,” International Journal of Health Systems