# ORGAN MATCHING & TRANSPLANTATION BLOCK CHAIN

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**ABSTRACT:** Organ matching and transplantation are life-saving medical procedures that require accurate donor–recipient compatibility assessment to reduce rejection risks and improve transplant success rates. However, the current organ transplant system faces several challenges, including inefficiencies in donor-recipient matching, concerns about data security, organ trafficking, and limited transparency in allocation procedures. Blockchain technology provides a decentralized, secure, and transparent solution to address these problems. By using blockchain, organ donation registries can be securely maintained, ensuring that donor and recipient records remain tamper-proof and reliable. Smart contracts can automate the matching process based on predefined compatibility criteria, improving efficiency and reducing waiting times for patients. In addition, blockchain technology improves traceability, helping to prevent fraud and unethical activities in organ allocation. This paper explores the integration of blockchain technology in organ matching and transplantation systems, highlighting its potential to enhance data integrity, increase transparency, and streamline the transplant process, ultimately improving trust among stakeholders and saving more lives.

**KEYWORDS:** Decentralized System, Python (flask), Block chain Technology

## I. INTRODUCTION

Organ transplantation is a critical medical procedure that offers a second chance at life for patients suffering from organ failure. However, the success of transplantation depends heavily on precise organ matching, ensuring compatibility between donors and recipients to reduce the risk of rejection. Despite advancements in medical science, the organ transplant system faces several challenges, including a shortage of donor organs, inefficiencies in the matching process, lack of transparency in organ allocation, and risks of organ trafficking. Additionally, the centralized nature of current organ registries raises concerns regarding data security, unauthorized modifications, and inequitable distribution.

Blockchain technology has emerged as a revolutionary solution to address these challenges by providing a decentralized, transparent, and secure platform for organ matching and transplantation. By leveraging blockchain's immutable ledger, donor and recipient data can be securely stored and accessed without the risk of manipulation. Smart contracts can automate the organ matching process based on predefined medical criteria, reducing human errors and delays. Furthermore, blockchain enhances traceability by maintaining a transparent record of organ allocation, ensuring ethical practices and eliminating fraudulent activities

## II. LITERATURE SURVEY

The literature survey delves into existing research and scholarly works that contribute to the understanding of organ donation, transplantation, and the application of block chain technology in healthcare. Literature provides a foundation for our research, guiding the development of a blockchain based solution aimed at overcoming existing limitations in the organ donation and transplantation domain. From the paper [1], The provided excerpt outlines the challenges faced by contemporary organ donation and transplantation systems, emphasizing the need for an end-to-end solution that addresses legal, clinical, ethical, and technical constraints to ensure a fair and efficient process, ultimately enhancing patient experience and trust. The paper proposes a novel approach utilizing a private Ethereum blockchain, introducing decentralization, security, traceability, auditability, privacy, and trust worthiness to the organ donation and transplantation management. The implementation includes the development of smart contracts and the presentation of six algorithms, accompanied by their detailed implementation, testing, and validation. The paper evaluates the performance of the proposed solution through analyses of privacy, security, and confidentiality, comparing it with

existing solutions. Notably, the transparency of the project is emphasized by making the smart contract code publicly available on GitHub. This research contributes to evolving discourse on blockchain applications in healthcare, particularly in the organ donation domain, by providing a comprehensive solution that combines technological innovation with rigorous testing and evaluation.

From the paper [2], literature survey addresses challenges in traditional electronic health records (EHRs) where medical information is controlled separately by different hospitals, leading to difficulties in information sharing. Although cloud-based EHRs alleviate this issue, they introduce a new concern of centralization, with a focus on the cloud service center and key-generation center. The paper proposes a paradigm shift by integrating blockchain technology into EHRs, creating a decentralized solution termed blockchain- based EHRs. The paper proposes a paradigm shift by integrating blockchain technology into EHRs, creating a decentralized solution termed blockchain-based EHRs. This research contributes to the evolving landscape of secure and decentralized EHRs through the integration of blockchain technology and the introduction of an improved.

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## III. PROBLEM STATEMENT

The proposed organ matching and transplantation system introduces a highly secure, blockchain-based mechanism to address the inefficiencies and ethical concerns of traditional methods. By implementing a decentralized, transparent, and tamper-proof network, this system ensures fairness in organ allocation, enhances security, and prevents fraudulent activities such as organ trafficking and data manipulation. The use of blockchain technology eliminates reliance on centralized databases, reducing the risks of unauthorized access, cyberattacks, and data corruption. Every transaction, from donor registration to organ allocation, is securely recorded on a blockchain ledger, ensuring an immutable and verifiable history of organ donations and transplants.

A key feature of this system is the integration of smart contracts to automate the organ matching process. These contracts execute predefined rules that assess donor-recipient compatibility based on factors such as blood type, HLA matching, medical urgency, and geographical location. Once a match is identified, the smart contract automatically notifies medical professionals, eliminating delays caused by manual intervention. The automation of organ matching not only increases efficiency but also reduces errors that could lead to mismatches and organ wastage.

Additionally, artificial intelligence (AI) is incorporated to enhance predictive analysis, ensuring that the most suitable donor-recipient pairings are identified based on medical history, previous transplant success rates, and patient conditions.

To further enhance security, the proposed system employs advanced encryption techniques such as AES-256 and RSA to protect sensitive medical data. Only authorized healthcare professionals and transplant authorities can access donor and recipient details using cryptographic keys, ensuring that patient information remains confidential. Multi-factor authentication (MFA) and biometric verification further strengthen access control, preventing unauthorized modifications to critical records. With blockchain's transparency, stakeholders such as hospitals, regulatory bodies, and patients' families can track organ allocation in real-time, eliminating favoritism and increasing trust in the system.

The proposed block chain-based system also plays a vital role in preventing illegal organ trade and black-market activities. Since all transactions are recorded on a tamper-proof blockchain ledger, unauthorized or suspicious activities can be easily flagged and investigated. This enhances ethical practices in organ transplantation, ensuring that organs are allocated based on medical need rather than financial or political influence. By establishing a transparent and

incorruptible network, blockchain effectively eliminates the risks associated with fraudulent transactions and unethical practices in the medical field.

## IV. EXISTING SYSTEM

The traditional organ matching and transplantation system relies on manual record-keeping, centralized databases, and human intervention to manage donor and recipient information. This approach, though functional, is slow, prone to errors, and lacks transparency.

1. Manual Registration and Data Handling
Hospitals and organ donation center manually collect donor and recipient information using paper forms or outdated digital databases. Medical professionals must verify eligibility based on blood type, organ compatibility, and medical history. Since data entry is performed manually, there is a higher chance of errors, leading to potential mismatches or delays in transplantation.

2. Centralized Matching System
Organ transplant organizations operate through a centralized database where donor-recipient matching is performed. This system depends on medical experts and transplant coordinators to review and approve matches. However, the centralized nature of the system creates a single point of failure, making it vulnerable to hacking, data corruption, and manipulation.

3. Lack of Real-Time Matching and Automation
The old approach does not efficiently automate the matching process. When a donor organ becomes available, medical professionals must manually search for a compatible recipient, causing delays. Time sensitive organs like hearts and lungs require immediate transplantation, and delays can lead to organ wastage.

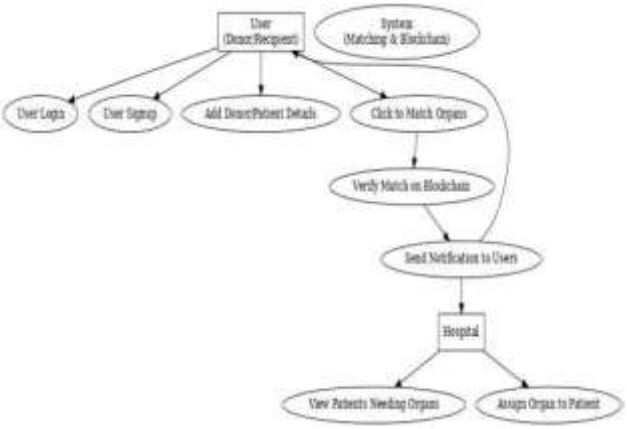
4. Security and Ethical Concerns
- Data Security Issues: Since centralized databases store sensitive patient information, they are vulnerable to cyberattacks and unauthorized access.
- Transparency Issues: Patients and their families have limited visibility into how organs are allocated, leading to trust issues and ethical concerns.
- Organ Trafficking: In some cases, corruption within the system has led to unethical practices, such as black-market organ trade and preferential treatment for wealthy patients.

5. Inefficiencies in Organ Transportation and Logistics
Once an organ match is identified, it needs to be transported to the recipient's location within a short time frame. Communication gaps and logistical inefficiencies in the old system often cause delays, leading to organ wastage.

## V. ALGORITHMS

- Smart Contract: Smart contracts are simply programs stored on a blockchain that run when predetermined conditions are met. They typically are used to automate the execution of an agreement so that all participants can be immediately certain of the outcome
- SHA256 Hash generation: SHA-256 stands for Secure Hash Algorithm 256-bit and it's used for cryptographic security. Cryptographic hash algorithms produce irreversible and unique hashes. The larger the number of possible hashes, the smaller the chance that two values will create the same hash.

## VI. METHODOLOGY

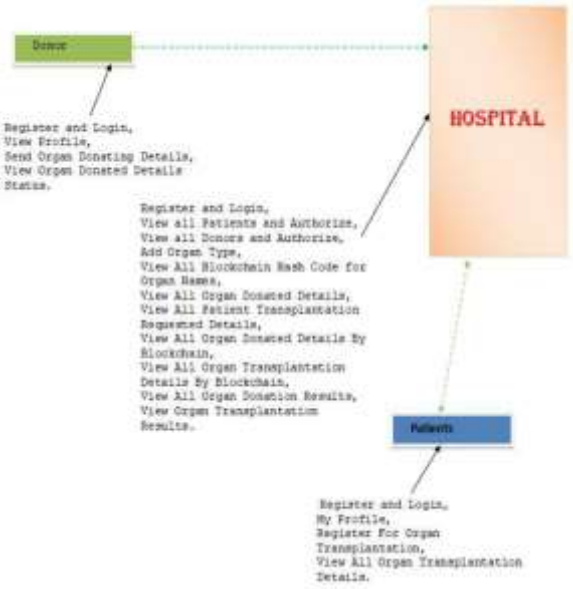



Patient and Donar registration**:**
Both organ donors and recipients (patients) will have their health and medical records securely encrypted and stored on the blockchain. This ensures that the information is immutable and accessible only by authorized parties.
Checking patient and donar is matching:

When both information is give in blocks they hostipal will check both information and check wheather both are matching or not.

Sending alert:
After matching both information click on matching then there will alert message option send alert to both.

## VII. SYSTEM ARCHITECTURE



## VIII. IMPLEMENTATION

Choose Python as the programming language, leveraging the Flask framework for web application development, as suggested in the paper. Set up a development environment using VS Code for coding, as mentioned in the methodology.

Donors

In this module, the Donor will register and login then uploads their organ donor data to Hospital and will do the following operations such as View Profile, Send Organ Donating Details, View Organ Donated Details Status.

Patients

In this module, patients logs in by using his/her user name and password. After Login User will do some operations such as My Profile, Register For Organ Transplantation, View All Organ Transplantation Details.

Hospital

The Hospital manages Hospital records to provide organ storage service for donation and transplantation and also performs the following operations such as View all Patients and Authorize, View all Donors and Authorize ,Add Organ Type, View All Blockchain Hash Code for Organ Names,View All Organ Donated Details, View All Patient Transplantation Requested Details,View All Organ Donated Details By Blockchain,View All Organ Transplantation Details By Blockchain, View All Organ Donation Results,View Organ Transplantation Results.

## IX. CONCLUSION

In this paper, we have proposed a private Ethereum blockchain-based solution that manages organ donation and transplantation in a decentralized, accountable, auditable, traceable, secure, and trustworthy manner. We developed smart contracts that ensure the data provenance by recording events automatically. We present six algorithms with their implementation, testing, and validation details. We analyze the security of the proposed solution to guarantee that smart contracts are protected against common attacks and vulnerabilities. We compare our solution to other blockchain-based solutions that are currently available. We discuss how our solution can be customized with minimal effort to meet the needs of other systems experiencing similar problems. In the future, our solution can be improved by developing an end-to end App. Furthermore, the smart contracts can be deployed and tested on a real private Ethereum network. Finally, the Quorum platform can provide better confidentiality because transactions among entities can only be viewed by specific participants and nobody else, which is not the case in our solution, where transactions between two participants are viewed by other actors authorized in the private blockchain.

## X. RESULTS


In above screen click on 'New Hospital Signup Here' link to get below page


In above screen hospital is entering signup details and then press button to get below page

**REFERENCES**

[1] L. A. Dajim, S. A. Al-Farras, B. S. Al-Shahrani, A. A. Al-Zuraib, and R. Merlin Mathew, „„Organ donation decentralized application using blockchain technology,"" in Proc. 2nd Int. Conf. Comput. Appl. Inf. Secur. (ICCAIS), May 2019, pp. 1–4, doi: 10.1109/cais.2019.8769459.
[2] Srihari Rao Nidamanuru, Rajesh Tiwari, Bhaskar Koriginja, Jincy Denny, J Ramesh Babu, "Identifying the Websites that Maintain Operational Standards through Obligation Links to Website-Standards Approval Body", Turkish Journal of Computer and Mathematics Education, Vol. 12, Issue 10, 2021, pp 4456-4461, e-ISSN: 1309-4653.
[3] MD Rafeeq, VH Shastri, B Anandh, V Shanmugasundaram, PR Kumar, ... , An intelligent road traffic data management for upgrading real time performance AIP Conference Proceedings 2426 (1)
[4] Facts and Myths About Transplant. Accessed: Apr. 21, 2021.
[5] Organ Procurement and Transplantation Network. Accessed: Apr. 18, 2021.
[6] . Mrs.G.Sumalatha, B.Shiva Teja , B.Kranthi , K.Vijay Kumar, Financial Fraud Detection Anomaly Feature detection, , International Journal of Research, ISSN NO: 2236- 6124, Volume VIII , Issue I, January/2019.
[7].Sheo Kumar, Mrutyunjaya S Yalawar, K-NN SEMANTIC Inquiry on Scrambled Social Information BASE, ICDSMLA 2019: Proceedings of the 1st International Conference on Data Science, Machine Learning and Applications,982-991, 2020,Springer Singapore
[8] Harvard Business Review. (Dec. 13, 2021). Electronic Health Records Can Improve the Organ Donation Process.
Accessed: Apr. 8, 2022
[9] U. Jain, Using block chain technology for the organ procurement and transplant network,"" San Jose State Univ., San Jose, CA, USA, Tech. Rep., 2020, doi: 10.31979/etd.g45p-jtuy.
[10] M. He, A. Corson, J. Russo, and T. Trey, „„Use of forensic DNA testing to trace unethical organ procurement and organ trafficking practices in regions that block transparent access to their transplant data,"" SSRN Electron. J., 2020, doi: 10.2139/ ssrn.3659428.
[11] P Chatterjee, SR Dutta, M Rafeeq2022 8th International Conference on Smart Structures and Systems (ICSSS), 01-05, Comparison of segmentation of CU-Net, DRU-Net and DU-Net on Cervical Cancer Data Set.
[12] D. P. Nair. (2016). Organ is Free, Transplant Cost is Problem.
[13] P. Ranjan, S. Srivastava, V. Gupta, S. Tapaswi, and N. Kumar, „„Decentralised and distributed system for organ/tissue donation and transplantation,"" in Proc. IEEE Conf. Inf. Commun. Technol., Dec. 2019, pp. 1–6, doi: 10.1109/cict48419. 2019.9066225.
[14] A Review on Various Cloud-Based Electronic Health Record Maintenance System for COVID-19 Patients.
[15]. Kumar, A., Mozar, S „An Overview of Various Security Issues and Application Challenges of the Attacks in Field of Blockchain Technology". In:. (eds) ICCCE 2021. Lecture Notes in Electrical Engineering, vol 828. Springer, Singapore