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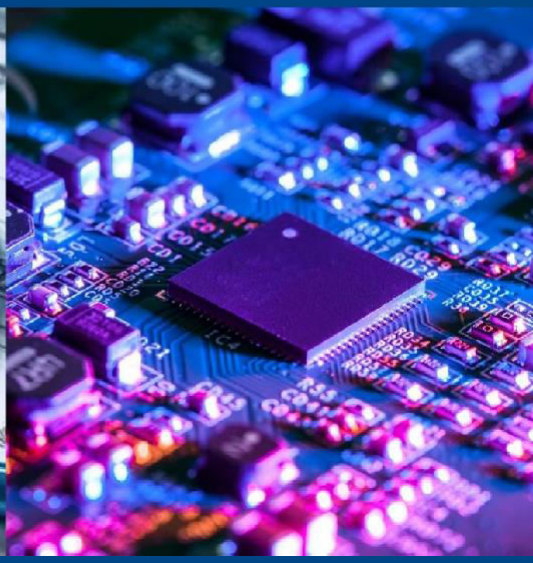

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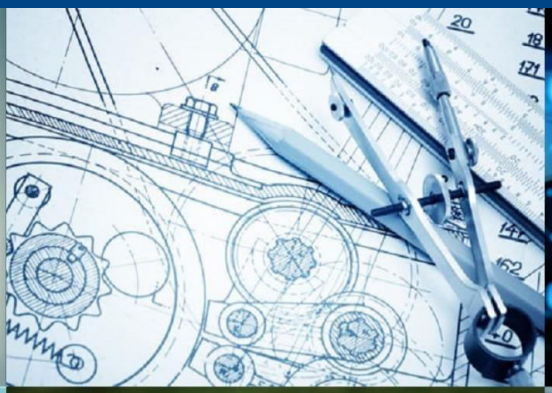

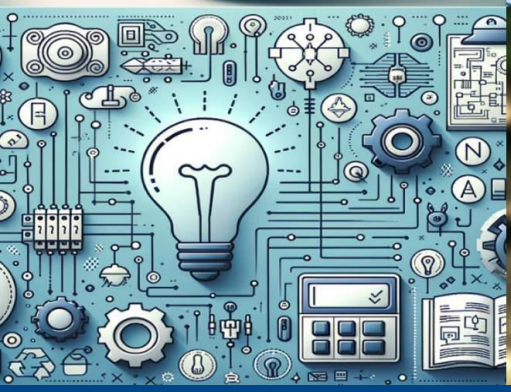

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Decentralized Voting System using Blockchain

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ABSTRACT: In a democratic regime, voting is crucial to making collective decisions. Unfortunately, although this activity has great significance and value, little effort has been made to improve the way we vote. Paper ballots are still the most used method, although this method is relatively simple, brings many inconveniences, and represents a contradiction to the modern world and its advances. Election has a very major role in democracy because it is the deciding factor of the future of a country but the major concern is that society doesn't trust the election system. Flawed electoral system is the issue faced by even the world's largest democracies like India, United States, and Japan. Overtime, the voting systems have evolved and the breach of security has evolved. The major issues that need to be addressed in the current voting system are vote rigging, EVM hacking, polling booth capture and election manipulation. The problems were investigated in the voting systems in this project and attempting to propose the online-voting model that can solve these problems. Using an efficient hashing algorithm technique, block formation and sealing, data collection and result declaration by versatile blockchain method is needed to solve the issue a high-end to end system that ensures security and privacy.

KEYWORDS: Admin table, Voters register, Political party register, Voted details, Vote count, Block chain.

I. INTRODUCTION

The rapid growth of vehicular traffic in modern cities has led to a significant increase in the number of road accidents worldwide. According to the **Ministry of Road Transport and Highways (MoRTH)**, India alone witnessed over **4.6 lakh road accidents in 2022**, resulting in more than **1.68 lakh fatalities** and injuries to over **4.4 lakh people**. Globally, the **World Health Organization (WHO)** reports approximately **1.3 million deaths** and **50 million injuries** annually due to traffic-related incidents. These alarming statistics underscore the urgent need for improved emergency response mechanisms to minimize fatalities caused by delays in medical assistance.

One of the primary challenges in post-accident care is the **delayed arrival of ambulances**, often due to **poor ambulance positioning**, **traffic congestion**, or **lack of coordination** between traffic authorities and healthcare providers. In most critical accident cases, a few minutes can determine whether a life is saved or lost. Therefore, **optimizing the response time of ambulances** is essential.

The **LifeSaver system** addresses this issue by introducing an **intelligent ambulance positioning and alert system** based on **Variational Deep Embedding (VaDE)**. This AI-powered system identifies **accident-prone zones** using unsupervised clustering methods, ensuring that ambulances are placed in locations with the highest probability of need. Furthermore, the system integrates **real-time alerts** to hospitals and traffic departments to facilitate **swift route clearance** and prepare medical teams in advance.

II. METHODOLOGY

Blockchain Integration

The Blockchain Integration module is designed to ensure the security, transparency, and integrity of stored in blocks. This module integrates blockchain technology into the system's architecture, providing a decentralized and tamper-resistant foundation for party's ,user voters storage and verification. Integrated with the voting Management module, the Blockchain Integration module ensures a cohesive and user-friendly experience. Users can interact with blockchain-stored details through the application interface, facilitating easy management and verification.

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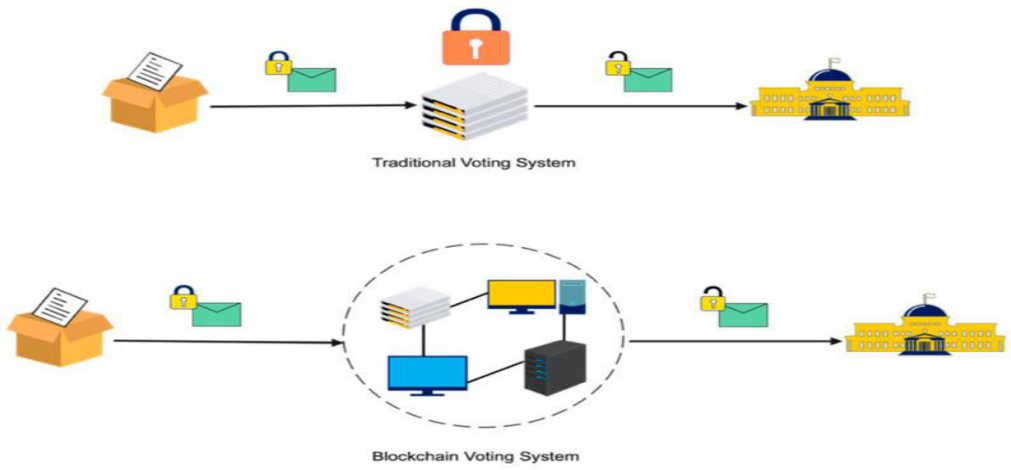
VOTERS AND POLITICAL PARTYS PRIVACY

Privacy in the context of online voting means that no one except the voter knows how a participant has voted. Achieving this property mainly relies on one (or more) of the following techniques: blind signatures, homomorphic encryption, and mix-networks . Blind signature is a method of signing data when the signer does not know what they are signing.

It is achieved by using a blinding function so that blinding and signing functions are commutative– Blind(Sign(message)) = Sign(Blind(message)).

The requester blinds (applies blinding function to) their message and sends it for signing. After obtaining a signature for a blinded message, they use their knowledge of blinding parameters to derive a signature for an unblinded message. Blind signatures mathematically prevent anyone except the requester from linking a blinded message and a corresponding signature pair with an unblinded one .



Siamese network Architecture

VOTING SECURE SYSTEM

The Voting Secure Transmission module in the online voting Web App ensures the secure exchange of voters data between users or admin and the system. This is achieved through the implementation of a One-Time Symmetric Key mechanism for each transmission event.

- **Access Authorization and Key Generation**

Upon a legitimate access request, the system dynamically generates a unique one-time symmetric key exclusively for the specific certificate access event. This key serves as a secure access token for the transmission process.

- **Secure Key Transmission**

The newly generated one-time symmetric key is securely transmitted to the authorized user or admin through a protected channel. Techniques like secure sockets layer (SSL) or transport layer security (TLS) may be employed to ensure the confidentiality of the key during transmission.

USER INTERFACE

The User Interface outlines the interactions and functionalities for admin Issuers, Admin and user within the proposed system.

ADMIN MODULE

- **Login:**Admin log into the system by providing necessary details.Upon the successful registration , admin receive the approval with login details for the accessing the system.

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- **Registered the party's :** Using the platform the parties registered the political parties for individuals ensuring accuracy.
- **Block Storage** : The generated parties are securely in the blockchain. Each with the unique parties identifier code.

USER MODULE

In a decentralized voting system using blockchain, user modules would likely be components or functionalities within the system that cater to the actions and interactions of users participating in the voting process. Here are some typical user modules you might find in such a system.

- **Voters Login:** This module handles enter the registered Aadhar_number or voter_ID logs in to the system.the registration of eligible voters onto the blockchain network. It may involve identity verification and authentication processes to ensure the integrity of the voting pool.
- **View user_details:** After the login the user view the user information like, voter_id, name, date_of_birth, contact, region, address, email, user picture.
- **Election_conditates view:** This module allows voters to verify that their votes have been accurately recorded on the blockchain. It enhances transparency and trust in the voting system.
- **Select the conditate:** This module aggregates and counts the votes recorded on the blockchain to determine the election results. It should ensure accuracy and fairness in the tallying process.

USER_AUTHENTICATION AND VOTE CASTING

The voter requests registrations from the registration interface. This later requests the voter's proof of identity. The voter provides the NEIC and life picture as proof of identity. Upon successful verification at the registration interface from authorities, the voter is added to the eligible voter's list.Upon successful acceptance of the voter by the authorities and added to the eligible voter's list, the voter communicates with the voting interface to request the Evert and voting. Then, the voting interface provides the candidate's list or rejects the voting request. In the case of voting acceptance, the voter selects a candidate and validates their choice. The voting interface registers the voting action with the authorities and casts voting with the distributed ledger. Finally, the distributed ledger informs the voter.

TWO-WAY COMMUNICATION

The Two way Communication module used to manage interactions among users, ensuring efficient communication, and providing timely responses to various system requests. This module is designed to streamline the exchange of requests and responses, contributing to the overall effectiveness and reliability of the system.Real-time notifications keep users informed of incoming requests and responses, enabling prompt attention to system interactions. This module serves as an effective communication and ensuring a seamless and secure exchange of information among admin, Holders, and Verifier within the web voting system.

NOTIFICATION

The Notification Module ensuring users receive timely alerts and updates. This module delivers real-time notifications through various channels, including email, SMS, and in-app alerts. Users can customize their preferences, acknowledging received alerts for enhanced communication efficiency. Tamper detection alerts, verification confirmations, and scheduled reminders contribute to a proactive and informed user experience. Integrated into the system's audit trail, the module facilitates post-incident analysis and ensures secure communication channels for confidential information. Keeping voters, Issuer, and admin well-informed and engaged.

III. RESULT AND DISCUSSION

The proposed **LifeSaver system**, powered by **Variational Deep Embedding (VaDE)-based clustering**, demonstrates significant improvements in emergency medical response, particularly in ambulance positioning and alert dissemination. The core achievement of the system lies in its ability to:

- **Accurately identify accident-prone zones** through unsupervised clustering techniques that combine **deep neural networks** and **Gaussian Mixture Models (GMM)**.
- **Predict optimal ambulance deployment locations** using a hybrid of **historical accident data**, **traffic flow information**, and **real-time incident reports**.
- **Reduce response time** significantly by ensuring ambulances are strategically placed in high-risk zones and by dynamically updating their positions based on new data.

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The **real-time alert module** effectively notifies both traffic and hospital authorities, which facilitates **quick route clearance** and prepares medical staff in advance. This synchronization enhances not only the speed but also the preparedness of the medical response, which is crucial during the "golden hour" of trauma care.

In simulated and real-data-driven scenarios, the LifeSaver system has shown:

- A measurable **reduction in ambulance dispatch latency**.
- **Better allocation of ambulance resources** based on predictive clustering.
- **Improved coordination** between ambulances, traffic departments, and hospitals.

Moreover, by integrating **GIS data** and **predictive simulation**, the system can offer ambulance placement suggestions and route recommendations that are sensitive to **current road conditions and traffic congestion**.

The results clearly validate the hypothesis that **data-driven and AI-enhanced systems**, especially those leveraging VaDE, can offer a **transformative impact** on public health outcomes through optimized emergency response logistics.

Future enhancements such as wearable sensor integration for transmitting patient vitals in real time could make the system even more powerful by enabling paramedics to anticipate treatment before arriving at the scene.

IV. CONCLUSION

The design of a secured database system using blockchain technology is important to the society.As the world is advancing in a new technological age, especially in undeveloped countries like Nigeria that manage a lot of data due to its large population, there is a need to create a decentralized database system that will enable transparency in registering voters and casting votes without involving third party. If not adopted, may lead to mutability of data, single point failure regarding the third party and various security threats that might lead to malicious acts. This has contributed to the massive manipulation of votes in our voting system as well as being vulnerable to attackers. Therefore, introducing a blockchain-based database in our voting system will help minimize the scalability issues which will in turn creates trust between different participants who want to enter into a business agreement through the consensus algorithm, complete transparency of data and decentralized while keeping the users' privacy.The system will enable the government and college to minimize the cost of conducting elections while increasing trust, security, transparency and trace-ability of data shared across a business network and as well encourage more people to participate in the democratic process.

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