

# E-Voting Using Blockchain

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**Abstract:** In the last few decades, technological advancements have revolutionized people's lives. Many ways can be used to manipulate physical voting, so it is not safe. In addition to being not transparent, physical processes suffer from low voter turnout, tampering with votes, falsification, delay in results, security concerns. Security will always be the most important factor to consider when implementing a digital voting system. In making decisions of such magnitude, data security and defense against attacks are of utmost importance. An answer to security concerns might be found in blockchain technology. This is an exciting advancement in the field of distributed ledgers. All transactions are grouped together in a block. There are several notable characteristics in blockchain, such as immutability, anonymity, decentralization, transparency, security. On a decentralized architecture, we aim to provide an open, fair, and independently verifiable voting scheme. Voters' privacy should be protected by a secure, transparent, and duplicate-free e-voting system.

**Index Terms/ Keywords:** Blockchain, Ethereum, Metamask, Ganache, Security

## I. INTRODUCTION

Election is an important event in all colleges or organizations. In any college or institution or organization election is the most renowned and important event conducted which allows its students to exercise the power of voting and electing their representatives. To protect this right of students conducting fair elections is the basic prerequisite for any college. Many times it happens that the representatives are selected on the basis of grades or by the teachers which leads to hypocrisy and fraud. As in the democratic elections it is said "Of the people, by the people for the people". The same can be fulfilled in institutional elections too, "Of the students, by the students, for the students". Any organization or college or class faces a lot of issues if the elected leader is not capable of the position to which he or she is elected. The E-Voting System using blockchain provides the security to a voter to vote for the candidate of their choice. Blockchain technology can be used to find the genuineness of the product. Blockchain is an arrangement of all the information that is recorded in the form blocks

which makes it difficult to change, hack or cheat. One of the major reasons for blockchain being secure is decentralization. Blockchain is not stored in one single computer. Alternatively, it is handled by a network of computers. Voting systems should ensure that votes have been counted and provide proof that votes have been cast. Systems should not be controlled by a single entity through a voting system.

## II. RELATED WORK

Paper titled The Next Gen Election: Design and Development of E-Voting Web Application proposed a voting system based on the internet. A login page allows voters to login and enter all their information, which will be centralized on a server. Election Commission of India will host and maintain the server and database. As explained in the paper, this will reduce the cost of voting, reduce the time required to conduct elections, and simplify the whole voting process.

Paper titled An Efficient and Secure Students Online Voting Application by Bhushan M. Pawar; Sachin H. Patode; Yamini R. Potbhare; Nilesh A. Mohota [3] suggested a web based voting system based on internet technology, which captures votes and tallies the results. By using this system, a lot of processes will be shortened and human mistakes will be prevented, as well as tampering with votes will be avoided. Identifiers are used to verify each voter, in this case, a student registration ID. Since only unique IDs are allowed, the system cannot be manipulated.

Paper titled Online Voting System Using Biometric Verification by Mrunal Annadate, Shreyans Sunil Gandhi, Nivita Ravi Kaniampal, Pushkar Satish Naral [5] aims to create an online and automated voting system that reduces the overall election process time and improves voter comfort. The project has two modules. During the first module, the voters are registered in the system, while during the second module the actual voting occurs. An individual voter's unique identification number and fingerprint information will be stored in a database. In this

paper, we discuss the importance of maintaining the privacy of voters while they vote – the necessity of biometric verification for identifying each voter uniquely. In other words, the voter's identity should be kept confidential and no link should exist between the voter's vote and the voting record.

The paper titled Literature survey- Online Voting: voting System Using Blockchain by Vaibhav Anasune, Pradeep Choudhari, Madhura Kelapure, Pranali Shirke, Prasad Halgaonkar[12] presents a brief overview of various voting methodologies that are currently used in online elections. This paper will contribute to the development of a system that meets upcoming challenges and eliminates their drawbacks. Today, e-voting is becoming more popular by private or public organizations due to the decrease in costs and delay in releasing voting results. It was the paper based voting system that was replaced by the e-voting system.

Paper titled A Brief Analysis of Blockchain Algorithms and Its Challenges by Rajalakshmi Krishnamurthi Tuhina Shree[16] discusses blockchain as a decentralized ledger that allows transactions to be carried out. Several applications based on blockchain technology are discussed in this paper, including those that cover a wide range of fields such as financial services, government services, non-financial services, internet of things (IoT), and more. Since Blockchain is decentralized, there is no need for a central authority. The paper summarizes briefly the core structure and workings of blockchain technology, which is a public, shared, and tamperproof ledger that allows individuals to share information with confidence. Records are stored in blocks in Blockchain databases, which are distributed, distributed, fault-tolerant, and only allow appends.

### III. BLOCKCHAIN CONCEPT

A decentralized method of storing information is called blockchain. Decentralization refers to the absence of a centralized authority in charge of all data and information. It can be confusing because different people/organizations use the term "blockchain revolution" to refer to various ideas. Instead of keeping data on a single centralized server, decentralized records, or records of transactions that are present on numerous network nodes, are what are actually meant.

In blockchain, blocks are used to store information. There are three main components to each block. Blocks are used to store data and information. The second thing is that

every block has its own hash that helps to identify it among other blocks. Every blockchain has its own QR code. Third, every block stores the hash value of the previous one.

Blocks, or properties, are permanently linked by computer code using a network of individual computers, which authenticate every interaction.. That code contains fundamental elements: contracts, transactions, validations, and ledgers. These blocks contain properties of data, typically including a timestamp, user-to-user information from that individual block, and all others preceding it. Multiple blocks tie together to form a blockchain. These blocks cannot be altered retroactively. They are all stored on the blockchain network.

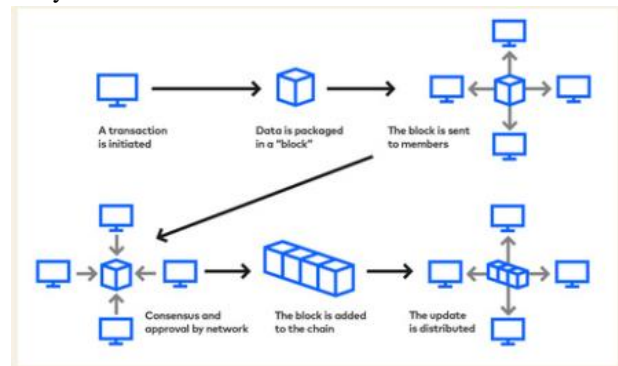


Fig 1:Blockchain

As shown in the figure the network of these nodes form a blockchain. A benefit of a blockchain is that all of the information is always publicly accessible via block explorers, which lets anybody view every single transaction.

- A. Ethereum: Blockchain platform Ethereum features smart contracts and is open-source and decentralized. Ethereum provides a way which allows us to use the power of the Internet without having to trust on apps like Google, Facebook or even our online banks having our personal information. Huge amount of data is collected and the information is stored in the server by various apps like Facebook and Google. This means that the user data is kept in a centralized format which means that the data is stored in a central location. Also it would create a lot of difficulty if any of these locations gets hacked. Thus Ethereum makes use of decentralized technology called blockchain which helps us by removing the need to trust on various apps with private data.[28]
- B. Metamask Browser Extension: With MetaMask, users can interact with Ethereum's blockchain using a software wallet. A browser extension or mobile app

is available for users to access their Ethereum wallet, allowing them to interact with decentralized applications. In addition to storing and managing account key information, broadcasting transactions, sending and receiving ethereum-based cryptocurrencies and tokens, MetaMask allows users to securely connect to decentralized applications through a compatible browser or the mobile app's built-in browser.[28]

- C. Solidity: Ethereum, the second largest cryptocurrency market by capitalization, released Solidity, a new programming language, led by Christian, in the year 2015. A few of the contracts which can be created with solidity include blind auctions, crowdfunding, multi-signature wallets, etc.[28]

#### IV. SYSTEM ARCHITECTURE

During the voting process, voters are required to enter their credentials. A transaction is then stored with all data encrypted. After this transaction has been broadcast to all nodes in the network, it is verified by each one. A block is added to the chain if the network approves a transaction. Blocks that are added to a chain cannot be removed. Once they are added, they are permanent. If the user wants to trace back the transaction, they can now view the results. These results are then seen by the users, where it displays all the candidates with the number of votes they have gathered. This preserves the anonymity of the voter as results don't display the name of the voter. Voting systems are insufficient to respond to modern security needs, so a new system must be built that integrates security, convenience, and trust. Blockchain technology can therefore be used to make voting processes more cost effective and time-saving by adding an extra layer of security and enabling people to vote at any time and anywhere.

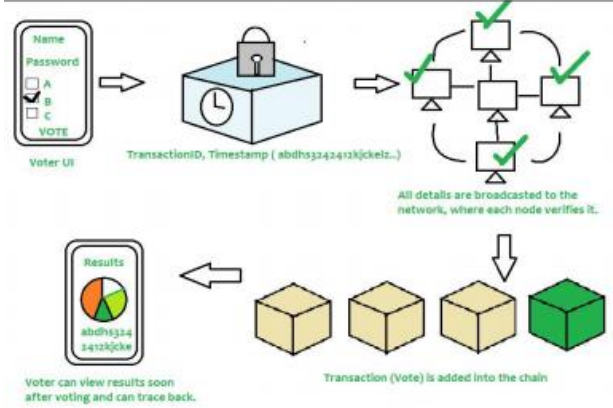


Fig 2: System Architecture

#### V. WORKING

The Election of council in colleges/schools/institutes/organizations is as important as democratic elections of any country. Offline Elections in colleges lead to so much hypocrisy and fraud. The E-Voting System can be a good option to minimize the challenges faced by the students/institutions. E-voting system has a way to complete its process in three phases:

- 1) Registration Phase: In this phase the candidate or student will be able to register for voting. The access to handle active and inactive status of this phase is with admin.
- 2) Voting Phase: In this phase the candidate or student will be able to access the right to vote. Once this phase is activated the registration phase will be closed. The access to handle active and inactive status of this phase is with admin.
- 3) Result Phase: In this phase the result of the deserved elected candidate will be displayed. Once this phase is activated by the admin the first two phases will be inactivated. The access to handle active and inactive status of this phase is with admin.

Every student has to register on the portal or website to cast a vote, and then register to vote as a voter.

The system is divided on the basis of login system :

1. Voter
2. Admin

The admin will be able to access the permission for the unique ID and allow the voter to vote. Also admin will be having all the additional authorities such as change phases, granting permission for voters to vote, add candidates, display results. The voter will have the right to vote and select the appropriate candidate as the head.

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1. Information
2. Voter Registration
3. Voting Area
4. Result
5. Log Out

Only the admin will have access to the following list of details:

1. Candidate Details
2. Add Candidates
3. Voter Registration
4. Change phase

The Registration will be authenticated each time the voter registers for voting via Email and by the admin with a pin by authenticating the ethereum address.

Each time the vote is casted or the changes are done by the voter or the admin may then, they may logout of the system.

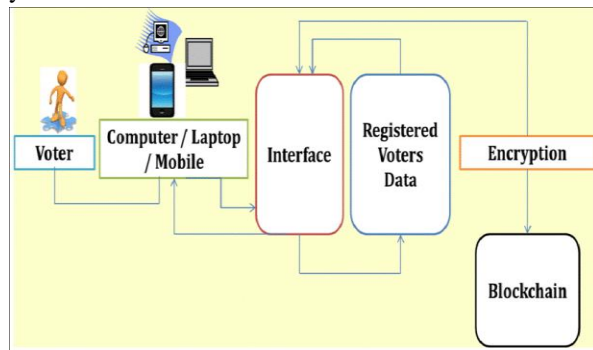


Fig 3: Working of proposed system

## VI. ALGORITHMS

We used Aadhar Card for verifying users without using any API. Verhoeff Algorithm is used behind the creation of a unique aadhar card number and also this algorithm is used to verify aadhar card number. Developed by the Dutch mathematician Jacobus Verhoeff in 1969, the Verhoeff algorithm is a mathematical formula for error detection. Using such a code, it is possible to detect all errors involving two adjacent digits, including those

caused by single-digit errors. Using JavaScript language, we verified a valid user and authenticated the system using this algorithm.

## VII. OUTPUTS AND RESULTS



FIG 4: Login Page

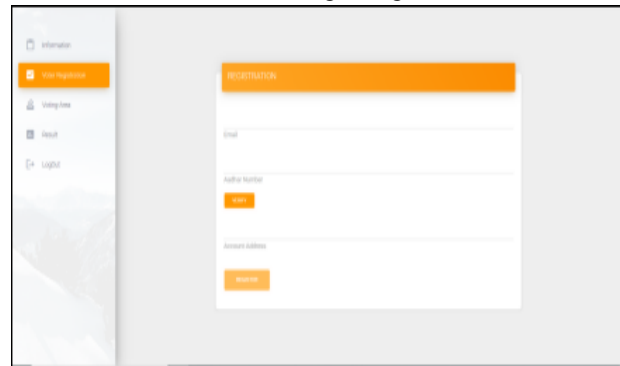


FIG 5: Voter

This is the page after the voter login which consists of sections such as Information, Voter Registration, Voting Area, Result Log Out. Each section performs unique functions.

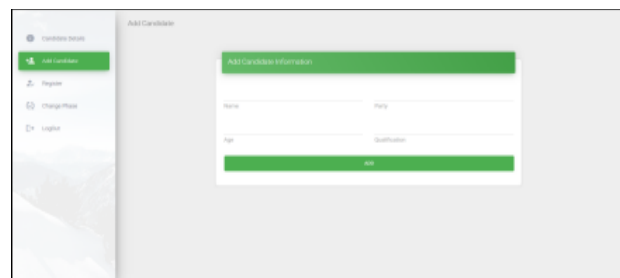


FIG 7: Add Candidates

This is the output after the admin logs in. This consists of sections such as Candidate details, Add Candidate, Voter Registration, Change Phase. Each section performs unique functions.

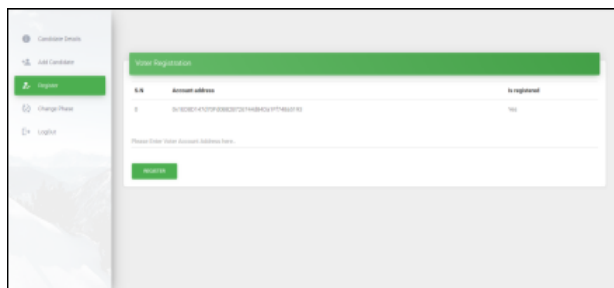


FIG 6: Voter Registration

This section provides voters with ether address from admin and the voter with his account is eligible to vote the candidate now.

### VIII. CONCLUSION

We propose to offer students the ability to vote remotely from anywhere through the internet. In addition to being fast and easy to access, it saves time, is efficient, reliable, low in costs, and easy to maintain because it requires a unique ID. In addition to reducing human error and time consumption, the e-voting system also reduces human effort. This blockchain system guarantees security, reliability, decentralized storage, and anonymity. There is a way to easily prevent vote manipulation and the delay of results. It makes it easier for both candidates and voters to verify their identities using the unique Aadhar number. Our system allows voters as well as candidates to verify each other easier. By implementing a secure online voting system, unauthorized access will be avoided. It simplifies the verification of voters by admins. Any organization is likely to benefit from improved reliability and transparency from this online voting system. We guarantee flexibility, transparency, scalability, authorization, authentication, and fairness.

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