# DECENTRALIZED VOTING SYSTEM USING BLOCKCHAIN

Ashlesha Shahare[1], Bhagyashri Kubade[2], Aishwarya Gadge[3], Avanti Ramteke[4], Prof. Rupali Vairagade[5]
*Department of Information Technology*
*G. H. Raisoni College of Engineering, Nagpur, India*

***Abstract*— In any democratic country, the right to vote is a fundamental right of every citizen, which makes it possible to choose future leaders. It gives individuals in the community a background to express their opinions. It helps them understand the importance of citizenship. Online voting systems are software platforms used more strictly for voting and elections. Because the digital platform eliminates the need to vote on paper or pick it up in person. It also protects the integrity of your vote by preventing a voter from voting multiple times. E-voting, often known as electronic voting, provides many benefits over paper-based systems, including enhanced efficiency and less errors. By enabling users to cast their votes from any Internet-connected device, an electronic voting system tends to maximise user involvement. Blockchain is a new, decentralised technology with a solid cryptographic base that has the potential to enhance many different elements of many different industries. To address the present e-voting concerns, e-voting could be expanded to blockchain technology. Here, we create a voting system based on blockchain that decreases election fraud and makes voting simple, safe, and effective.**

***Keywords—blockchain, Voting system, electronic records, decentralization and scalability etc.***

## I. INTRODUCTION

India is a democratic nation. With a digital ID called an Aadhaar card, every Indian has now joined the developing digital India. Voting procedures have changed from counting votes by hand in the beginning to using paper ballots, punch cards, and computerized voting machines. Transparency, decentralization, irreversibility, and non-repudiation are only a few of the features of the digital electronic voting system. The expansion of digital electronic voting systems raises a number of concerns about transparency and security. In this project, we deployed blockchain technology to address system requirements and resolve security issues in an electronic voting system. It presents fresh chances to set up a safe electronic voting system in any company or nation.

The method is decentralized and stores the outcomes as bitcoins in many locations, making it far superior than alternative systems.

***Blockchain***

Immutable, transparent, and effective systems can be implemented with the aid of blockchain technology. The most potent technology for voting systems is blockchain, which cannot be altered or deleted. A decentralized network with numerous linked nodes underpins blockchain technology. The shared data, which includes the entire history of all transactions carried out in the network, is available on each of these nodes in its own copy. The network is not under the control of a single system. If the majority of nodes concur, the transaction is accepted. Users of this network can stay anonymous. A fundamental analysis of blockchain technology (including smart contracts) indicates that it is an appropriate foundation for electronic voting and may also have the potential to significantly increase the acceptability and reliability of electronic voting [14-19].

Electronic voting is now easier, more affordable, and far more secure thanks to blockchain technology. It is an entirely new paradigm that aids in the development of distributed systems that guarantee data availability, integrity, and fault tolerance. This technological objective involves a systems revolution. Blockchain systems are composed of decentralized computer networks that are used to authenticate network transactions. They also produce blockchains, which are connected digital data ledgers. Blockchain records can never be changed. The benefits of electronic voting over the current system:

*Ratio of Participation Rising*

By enabling users to cast ballots from any location and on any Internet-connected device, the Internet Voting System seeks to reduce user involvement.

*Security*

Due to its significance, a blockchain-based electronic voting system has been built.

*Efficiency*

For instance, when compared to traditional paper voting, the election process is much more efficient when the costs of organization and implementation are reduced.

*Accuracy*

The human counting errors connected with voting are eliminated with electronic voting. publication of the results and votes received for each vote cast in a timely and accurate manner.

## II. RELATED WORK

The development of digital technology today has improved the lives of many individuals. In comparison to the election system, paper is today used for a variety of purposes. The old system's ever-expanding possibilities pose a threat to security and transparency. Because it uses a decentralised approach and the full database is held by multiple users,

blockchain technology is one answer. As an illustration, in this study we used Ethereum wallets and the Solidity programming language to create and test an electronic voting application as a smart contract on the Ethereum network.

Satoshi Nakamoto created a peer-to-peer payment system that enables monetary payments to be made over the Internet without the need for a trust or financial institution, which is how blockchain was first invented. Blockchain is a system with strong Byzantine fault tolerance and is secure by default. Without a doubt, the groundbreaking blockchain technology that underlies the well-known cryptocurrency Bit coin and its offspring will usher in a new age for the internet and online services. The low voter interest among the young tech population may be addressed through electronic voting. A potential answer would be to build electronic voting on blockchain technology, which would make it more open, transparent, and independently auditable. The promise of blockchain technology is enormous; at current state, it may not realize its full potential.

Since the 1970s, numerous electronic voting systems have been in use. These systems have significant advantages over paper-based ones, including more consistency and less inaccuracy. Many endeavours have been made to investigate the utility of blockchain to enable a successful electronic voting solution in light of the exceptional development in the use of blockchain technologies. It described one such project that makes use of the advantages of the blockchain, including cryptographic transparency and credentials, to create a successful electronic voting system. Secure digital identity management is one of the most recent and significant technical challenges for electronic voting systems. Before the election, every prospective voter must register with the electoral system. The proposed method has been used with several chains, and a careful assessment of the method demonstrates its usefulness in meeting the basic requirements of an electronic voting system.

Their data should be in a highly digitally processable format. In the old e-voting, the following problems can occur:

- Voting anonymously.
- Exorbitant installation charges up front.
- Growing issues with information security
- A lack of openness and confidence.
- Voting delays or inefficiencies associated with absentee voting

By utilising the blockchain, the following criteria are satisfied:

- Privacy and openness
- Only registered voters are allowed to cast ballots.
- Anonymity: The mechanism forbids linking voter identities to the votes they cast.
- Accuracy: Votes cast are permanently recorded and cannot, under any circumstances, be changed or amended.
- Verifiability: Vote counting can be used to confirm the system.

Many nations currently use electronic voting systems thanks to the advancement of technology. Each blockchain user may independently check the integrity of the data, which satisfies the standards of transparency and impartiality of electoral systems. The blockchain mechanism uses a decentralised design that can prevent system outages caused by hostile cyber assaults.

To accomplish justice, all electoral systems must adhere to the ideals of openness and fairness. Moreover, electronic voting systems must be secured from cyberattacks and denial-of-service (DDOS) attacks, which can slow down voting processes and possibly compromise vote integrity. This study develops a blockchain-based online security method for voting systems.

## III. SYSTEM ARCHITECTURE

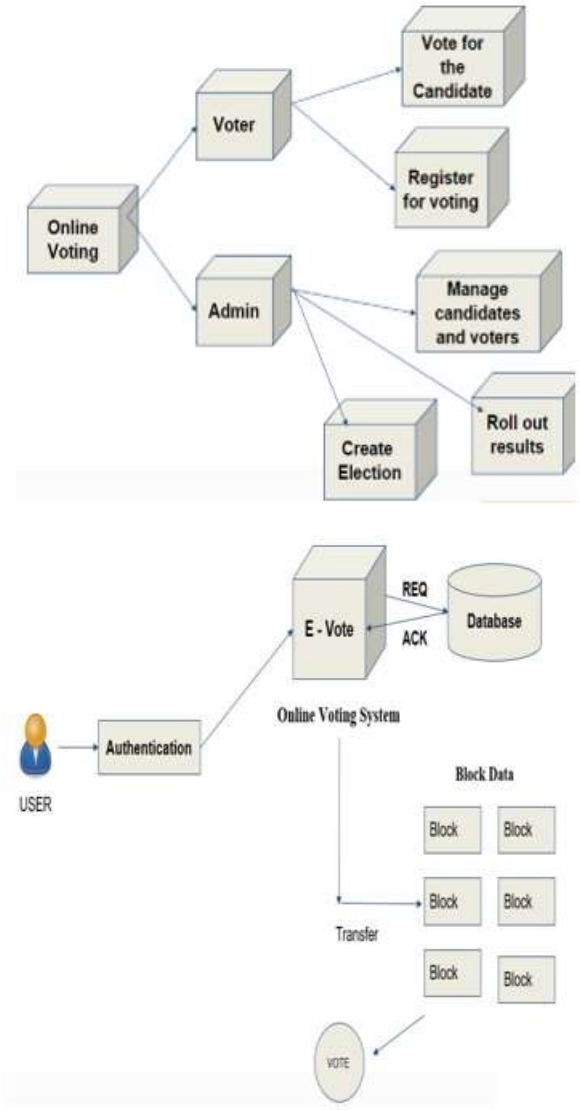



Fig.1. System Architecture

Due to the aforementioned issues, the current electoral system has to be improved. This can be accomplished by switching to a new system that will decrease election fraud and effectively raise voter turnout in place of the current one.

•The admin is the only person with the authority to oversee candidates, voters, and elections under this system. The votes can also be seen by the admin. The block can be checked and verified by the admin by looking to see if any votes have been altered.

•Voters can view elections and cast their ballots, as well as view the winner, but they are unable to view voting results or other information. The technique creates a block of each vote using Blockchain technology to safeguard the voter's identity.

User registration, user login, and admin login should all be available on an online voting system. The voter can log in and exercise his voting rights via this online voting system, which will manage voter information. The following questions will be posed to the voter at registration: full name, age, mobile number, and Aadhar card number. After verification, an email address will be provided. The voter would be required to enter his Aadhaar id when applying to vote. The voter will then be confirmed and given the option of selecting a candidate from the list. A candidate may only receive one vote per voter per election. Users of the software can enter onto their profiles and upload all of their information, including the previously mentioned breakthrough System. Admin has access to each candidate's information. Voters can view the list of candidates in their area via the software system. All data that does not pertain to the election regulations can be moderated and deleted by the admin, who has complete system rights.

• User registration, user login, and admin login are all features of the online election system.

• The voter's information will be managed by this online voting system, which the voter can use to login and exercise his voting rights.

• Voter registration forms will ask for the following information: You will be granted access after providing your full name, age, Aadhar card number, mobile number, and email address.

• Voters would be required to enter their Aadhaar numbers while requesting to vote. Once the voter has been verified, he or she can cast their ballot for any candidate on the list. A candidate may only receive one vote from a voter per election.

• The software program enables users to log in to their profiles and upload all of their information, including any previous milestones, to the database. The administrator can review each candidate's details.

• Voters can access a list of Candidates in their neighborhood thanks to the software system. The administrator has complete control over the system and is able to moderate and delete any information that is unrelated to election rules.

The following two primary modules have been taken into consideration:

**A. Admin**: There are 5 parts to the admin module.

1) Dashboard – It will have numerous charts to show data, such as the number of parties, voters, etc.

2) Add Candidate - Using this administrative tool, he can add candidates who are running for office. The user's side will display the candidate after it is added. Create Election: He will be able to create elections using this admin feature. Only after the election has been created by the admin may a user cast their vote. Between the start date and the end date, users can cast ballots.

Election details can be updated here, including the start and conclusion dates, among other information.

Candidate Details: All of the candidates that the administrator has added will be seen in the candidate information. If an incorrect entry is made, the administrator can change the applicant details.

**B. User-** There are 4 components that make up the user module.

1) Dashboard - Information about parties and their candidates can be found on the user dashboard. The user has access to all the candidate's information.
2) Voter Registration – In this part, users must first register before they may cast their ballots.
3) Voting Area: Only the registered user will be taken to this page to cast his vote after registration.

Results: The user will be able to view the election results in this component.

## IV. WORK DONE

*A. Proposed working scheme:*

For the proposed working scheme, we calculate two modules for execution.

in three stages. The two modules are:

• Application interface
• Solidity backend to implement the blockchain.

All these modules are considered as one phase and the remaining one phase involves connecting and testing these modules.

Step 1: In this step we will deal with the user interface module where an interactive user interface will be built for both the administrator and the user. At the same time, research related to the implementation of Blockchain in a distributed application is carried out.

Step 2: In this step, we cover the backend module, implement Blockchain using the Ethereum framework and convert the system into a decentralized application.

Step 3: Connecting two different
modules and testing the platform ends at this step.

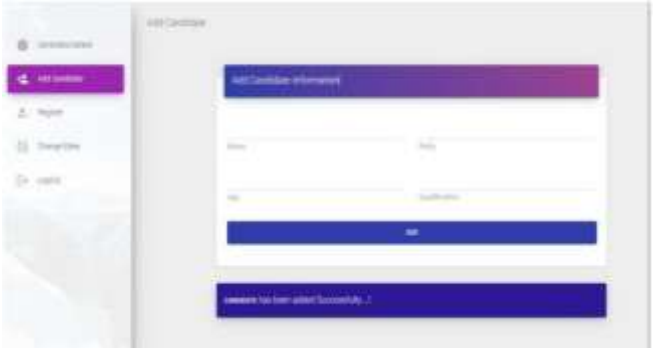

First Phase Breakdown:

We looked at 2 main modules which are:

1. Admin - Admin module is divided into 5 sections

Dashboard - It contains various graphs to display information like number of parties, number of parties. voters etc.

2. Add Candidate - In this function administrator can add candidates who apply. Once a candidate is added, it will be visible on the user side.



3.Creating Elections- This feature allows admin to create elections. The user can vote only after the administrator has created the election. User can vote between start date and end date.

4. Election Information - In this section, admin can update election information like start date, end date etc.

5. Candidate Information - Candidate Information shows all candidates added by the administrator. The administrator can update the applicant's details if the record is incorrect.

A. User- The user module is divided into parts

1. Panel- The user control panel contains information about political parties and their candidates. The user can see all the information of the applicant.

2. Register of Voters- In this section the first user must register only then he can vote.

3. Voting area- Once the user is registered, only he will be redirected to this page and then he can vote.

4. Results - in this section, the user can see the results of the elections.

## V. Data Analysis and Result

The current electoral system in India is an EVM (Electronic Voting Machine) based system. Before this system, there was paper voting and manual counting. The paper voting method has been criticized for fake booths and vote traps, with party supporters filling them with pre-filled fake ballot papers and blocking the booths.

To reduce fraud and make the voting process observable and verifiable, a new voting system must be installed in its place. As we can see, the Internet has altered every conceivable domain in an effort to transfer the current system on the web platform for quick and simple administration.

Even if we are aware that the existing system is trustworthy, we still need to make improvements. This step might use a blockchain-based online voting mechanism.

Blockchain is a decentralised, fixed, and unchangeable public ledger. Four primary processes underlie how this new technology operates:

• There is no single point of failure while maintaining a distributed ledger because the ledger is spread across numerous locations.

• Each "new block" proposed for the ledger must refer to a prior version of the ledger, producing an immutable chain from which the term "blockchain" derives, and preventing the integrity of earlier entries from being compromised.

We made an effort to design a decentralised application user interface that facilitates voting. We can assume that the user interface component makes up 30% of the overall work.

The majority of this system is based on blockchain technology, which is also in charge of the trustworthy voting mechanism.

## VI. Summary and Conclusion

In this project, we developed a blockchain-based electronic voting system that protects voter privacy while enabling safe and affordable elections. Blockchain technology presents a fresh chance to get over the drawbacks and challenges that come with the deployment of electronic voting systems, assure the safety and credibility of elections, and lay the groundwork for transparency. With all components of a smart contract, hundreds of transactions per second can be transferred to Ethereum's private blockchain, lightening the burden on the network. This overall effort has been separated into three modules in order to do this. We'll keep putting our system into practice or making changes while testing its efficacy in the future. There are still certain programs that can be used, though.

## Acknowledgment

We take this opportunity to express our profound gratitude and deep regards to Our Project Guide, Department of Information Technology, G. H. Raisoni College of Engineering, Nagpur which provided guidance and space for us to complete this work.

## References

[1] Sos.ca.gov. (2007). Top-to-Bottom Review | California Secretary of State. Available at: http://www.sos.ca.gov/elections/voting-systems/oversight/ top-bottom-review/.

[2] Nicholas Weaver. (2016). Secure the Vote Today Available at:https:// www.lawfareblog.com/secure-vote-today.

[3] TechCrunch, (2018). Liquid democracy uses blockchain to fix politics, and now you can vote for it. Available at: https://techcrunch.com/2018/ 02/24/liquid-democracy-uses-blockchain

[4] Ajit Kulkarni, (2018), "How To Choose Between Public And Permissioned Blockchain For Your Project", Chronicled, 2018.

[5] "What Are Smart Contracts? A Beginner's Guide to Smart Contracts", Blockgeeks, 2016. Available at: https://blockgeeks.com/guides/ smart-contracts

[6] Salanfe, Setup your own private Proof-of-Authority Ethereum network with Geth, Hacker Noon, 2018. Available at: https://tinyurl.com/ y7g362kd.

[7] Geth.ethereum.org. (2018). Go Ethereum. Available at: https://geth. ethereum.org

[8] Vitalik Buterin. (2015). Ethereum White Paper Available at: https: //github.com/ethereum/wiki/wiki/White-Paper.

[9] Ethdocs.org. (2018). What is Ethereum? — Ethereum Homestead 0.1 documentation. [online] Available at: http://ethdocs.org/en/latest/ introduction/what-is-ethereum.html

[10] Agora (2017). Agora: Bringing our voting systems into the 21st century Available at: https://agora.vote/Agora_Whitepaper_v0.1.pdf

[11] Patrick McCorry, Siamak F. Shahandashti and Feng Hao. (2017). A Smart Contract for Boardroom Voting with Maximum Voter Privacy Available at: https://eprint.iacr.org/2017/110.pdf.

[12] Andrew Barnes, Christopher Brake and Thomas Perry. (2016). Digital Voting with the use of Blockchain Technology Available at: https://www. economist.com/sites/default/files/plymouth.pdf

[13] Jonathan Alexander, Steven Landers and Ben Howerton (2018). Netvote: A Decentralized Voting Network Available at: https://netvote. io/wp-content/uploads/2018/02/Netvote-White-Paper-v7.pdf

[14] Rupali Vairagade: Vairagade, R.S. and SH, B., 2022. Enabling machine learning ‐ based side ‐ chaining for improving QoS in blockchain ‐ powered IoT networks. Transactions on Emerging Telecommunications Technologies, 33(4), p.e4433.

[15] Rupali Vairagade: Vairagade, R.S. and Savadatti Hanumantha, B., 2022. Secure Internet of Things network using light ‐ weighted trust and blockchain ‐ powered PoW framework. Concurrency and Computation: Practice and Experience, 34(21), p.e7057.

[16] Rupali Vairagade: Vairagade, R., Bitla, L., Judge, H.H., Dharpude, S.D. and Kekatpure, S.S., 2022, April. Proposal on NFT Minter for Blockchain-based Art-Work Trading System. In 2022 IEEE 11th International Conference on Communication Systems and Network Technologies (CSNT) (pp. 571-576). IEEE.

[17] Rupali Vairagade: Vairagade, R.S. and Brahmananda, S.H., 2020, April. Secured Multi-Tier Mutual Authentication Protocol for Secure IoT System. In 2020 IEEE 9th International Conference on Communication Systems and Network Technologies (CSNT) (pp. 195-200). IEEE.

[18] Rupali Vairagade: Prof. Dr. Brahmananda S H, R. S. V. (2020). A Comprehensive Analysis of the significance of Blockchain and AI for IoT Security. International Journal of Advanced Science and Technology, 29(3), 5542- 5553. Retrieved from http://sersc.org/journals/index.php/IJAST/article/view/6120

[19] Jelurida, "Jelurida", 2017. Available at: https://www.jelurida.com/sites/ default/files/JeluridaWhitepaper.pdf.