Statistical Analysis of Online Voting System through Block chain and ML Techniques: A Sustainable Approach for 21st Century Life Style and Smart Cities

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ABSTRACT

A digital voting system is a process that allows people to vote while sitting at their homes and is based on their face recognition identification. The votes will be counted and saved in a blockchain, based structure which is secure and immutable, thus giving availability with security in a system. The traditional voting system does not allow people to vote sitting at their home. Considering the situation of covid everything is going digital. Questions on EVM from losing parties regarding some malfunctioning. Digital, secured, reliable, user friendly and a low-cost system. Standing in long queues during voting is a tiring and time-consuming process.

DDoS assaults, polling booth capturing, vote tampering and manipulation, malware attacks, and other security issues are all present in today's voting systems. The voting process may be made more safe, transparent, immutable, and dependable by utilizing blockchain technology. (Hjálmarsson, F., et al. 2020) [4] has told that our current voting system is questioned by a variety of stakeholders, including political parties and ordinary citizens, because votes are manipulated, citizens find voting a time-consuming task, and, most importantly, the current pandemic situation

has digitized almost all areas of interest in our county (Chowdhury, A. et al., 2016)[2]. The authors have concluded that as a result, to resolve the issue produced by the physical voting system. Systems like deep fakes etc. are capable for hacking the biometric systems but the vote chain has been made hack proof by extra mechanisms.

The system we are creating is a blockchain based decentralized app which uses Machine Learning for identification of the user, it uses principles like face matching, checking confidence level and then allow the user to vote based on the verification of her/his documents and eligibility to vote without compromising the right to vote anonymously. The protocol has a number of key advantages. It doesn't rely on a dependable tally authority. All votes are submitted with full proofs of legitimacy and are available in encrypted form to the public. Using the homomorphic property of the encryption, we present a new encryption mechanism that ensures that no one can decrypt the votes, but that anybody can verify the legitimacy of the votes as well as the outcome of the tallying process. As a result, the election results are publicly verifiable.

Keyword-- *Online Voting System, BlockChain, eVoting, Machine Learning, End to End Encryption, EVM (Electronic Voting Machine)*

Motivation

The current voting system is questionable, we have seen a lot of news regarding manipulation in voting machines, hacking of EVM (Electronic Voting Machine) machines, etc. This is a common issue faced during the voting process. Manipulation in votes is another common issue faced during the voting process (Hjálmarsson, F., et al. 2020) [4]. Which creates dissatisfaction and misleading information. Since for voting sometimes people have to stand in long queues at the voting booths. Thus they find voting a hectic task. In today's era coronavirus digitized everything so voting can also be done online with transparency.

Scope of the Study

The scope of this study is to implement blockchain based decentralized voting system in wide array of opportunities. These can be implemented in various aspects such as areas where decent internet connection is available because it would enable them to exercise their vote without getting away from their place of stay. This study can also prove to be alternative to solve fake voting and booth capturing as there are many cases regarding the same and causes to be menace in democratic process of choosing our own leader. This study also shows that it produces a tamper-proof record that can be easily reviewed to guarantee that votes are recorded correctly so as to bring confidence within the voters as well.

Topic Organizations

This study, first of all, gives a general idea of decentralized voting system. Verifiable e-voting techniques often presume the presence of a public bulletin board that gives all voters with a

consistent view. For the endorsement of the study, the author team did a literary survey and reviewed some research papers of concerned topics etc. This literary survey provides deep knowledge about applications available where voting is implemented using blockchain.

The author team has described the methodology in which they have represented the methods used for the study. This study used the ML and blockchain techniques which are used to make a transparent and secure voting system. Further, the paper discusses the arrangement of collecting data which is presented in a logical sequence unbiasedly as a result. The Manuscript presents all data in graphical and tabular form as well.

Suggestions for specific applications to solve the challenges and constraints discovered in the assessment have been offered in the recommendation section, which is one of the most essential aspects of the research study. The novelty section refers to aspects of the research that are novel. Finally, the conclusion section summarizes the study's main findings and provides a final assessment.

Ethical Committee and Funding

The experiments don't include any human related experiments and so no ethical constraints have been violated. Though the subjects performing the study were humans and air quality directly affects them but the study doesn’t violate any health related measures. The Project is not funded by any agency.

Role of Authors

Rohit Rastogi acted as a team leader and coordinated with all the co-authors on different tasks which they need to do. He also guided other authors on various topics related to the manuscript and prepared the article for the research paper ensuring the quality of the work. Mr. Priyanshu prepared various diagrams related to the paper and also did the introduction and conclusion part for the research paper. Mr. Luv collected, analyzed, and did a comparative study of various ML model to find the best suited model for the project. He also did the literature survey required in the paper. Mr. Rajat studies, analyzed and compared various other online voting system in blockchain to get the idea how other project were implemented and what major problem we need to tackle in this research paper. He also did the study of various other technologies required for building the project and has described them in the paper.

Mind map

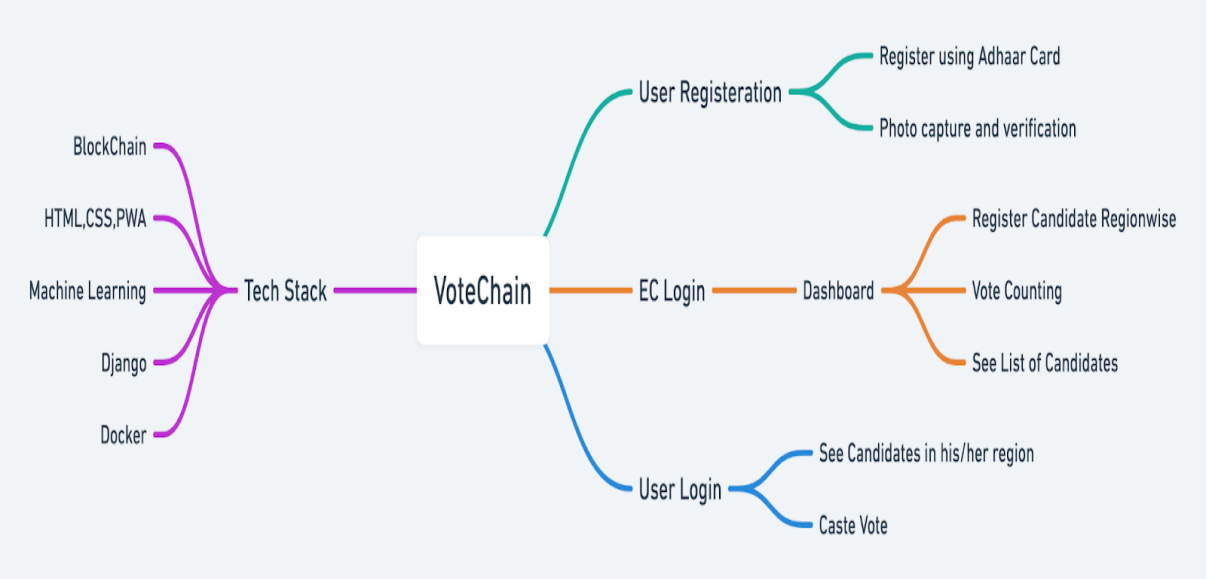

Figure 1. The Mind Map of our Proposed System

The above figure gives a brief structure of the mind map our system will based on. The tech stacks will be blockchain for storing votes, HTML, CSS, PWA will be used for the frontend and Django and ML will be used in the backend which will handle the business logic and authenticity of the voter (Pl. refer Fig. 1).

1. INTRODUCTION

Ethereum is the second most popular cryptocurrency. It is based on the same Blockchain technology as Bitcoin, which is an append-only ledger. A decentralized and open-membership peer-to-peer network maintains the Blockchain. The Blockchain's goal was to decentralize the function of banks in maintaining a financial ledger. Researchers are now attempting to repurpose the Blockchain to address other open issues such as Internet of Things coordination, carbon dating, and healthcare. The Blockchain Technology takes care of the privacy and values the tradeoffs of the approach.

In this paper, the author team has foscussed on decentralized internet voting utilizing Blockchain in this study. Verifiable e-voting techniques often presume the presence of a public bulletin board that gives all voters a consistent view. A distributed denial-of-service (DDoS) attack is a malicious attempt to disrupt the normal traffic of a targeted server, service or network by overwhelming the target or its surrounding infrastructure with a flood of Internet traffic. An e-Voting system using a decentralized database that resolves the problem of current voting systems which suffer from various security threats such as DDoS attacks, polling booth capturing, vote alteration and manipulation, malware attacks, etc.

1.1. Need and Applications of Block Chain using Big Data with Global Statistics

The use of blockchain in the voting process to make it more secure, transparent, immutable, and reliable. The system which will strongly connect with the ML (Machine Learning) model for verification of voters. To make an e-Voting system using a decentralized database that resolves the problem of current voting systems which suffer from various security threats such as DDoS attacks, polling booth capturing, vote alteration and manipulation, malware attacks, etc. The use of blockchain in the voting process to make it more secure, transparent, immutable, and reliable. The system which will strongly connect with the ML (Machine Learning) model for verification of voters (Hjálmarsson, F., et al. 2020) [4].

The Blockchain Market Revenue will reach $20 billion by 2024, according to Transparency and Market Research. The use and implementation of Blockchain technology is rapidly growing over the world, with government appearing to be the most extensively used domain at the moment. Dubai recently stated that 100 percent of its land registry documents would be stored on Blockchain. In fact, the DLD claims to be the first government body in the world to use Block chain technology for such a high-level work. The Republic of Georgia announced that Blockchain technology would be used to verify real estate governmental operations. Countries such as Sweden, Honduras, and others are working on Blockchain-based technologies to enable safe e-Government. In India, the state of Andhra Pradesh has become the first in the country to experiment Blockchain in two departments, with ambitions to roll it out across the board (Behra, G.K., 2019)[9].

Artificial intelligence (AI) is used in a variety of advanced technology domains, including decentralized AI, blockchain (BC), intelligence of things, machine automation, and so on. The combination of artificial intelligence and the Internet of Things offers advantages in terms of data collection and processing. If these processes are enabled by the government, then it is useful for creating attributes for a smart city that it generally offers (Sharma, A. et al., 2021)[10].

1.2. Complexity of Knowledge Management in Online Vote Cast and ML Based Knowledge Extraction

The online voting system will collect basic data of voters like their name, age, address, and voting area. This data will be used to derive various information like the age distribution in a particular constituency, the voting trend in a particular area. This can form a base knowledge of voters and voting trends in the area. The knowledge level will increase with more usage of the system and as more people will participate in the online voting process. By use of proper knowledge management techniques, proper development

work can be planned in an area. The beneficiary of particular government schemes can be formulated using this information. Thus a knowledge pyramid is formed which can be used for the advancement of people.

The data gathered from online voting can give insight about the gender distribution and age distribution of people in any constituency. After this information can be used for proper transfer of benefits from government schemes to different people. Moreover, this data can also be used for vaccine rollout during any pandemic or during any vaccination program. The health official can know the number of people based on gender or age who are required for vaccination. Since we are verifying the identity of people using a face recognition system, the same data used can be deployed at various other government programs for ensuring that benefit is given to the authorized authentic person.

Voting System in India is very complex phenomena and requires an automation of this task requires care of different dimensions. Voting System may be made efficient by different methods and block chain is one of the effective tool to make this process error proof and satisfying all constraints. Though it will require a high level of complexity and parallel and fast computing resources would have been required.

1.3. Voting Methods and Election Laws

Election law is a branch of public law that relates to the democratic processes, election of representatives and office holders, and referendums, through the regulation of the electoral system, voting rights, ballot access, election management bodies, election campaign, the division of the territory into electoral.

When the House is operating in the Committee of the Whole, all of these methods of voting are available except for the yeas and nays.

- Voice vote. A voice vote occurs when Members call out "Aye" or "No" when a question is first put by the Speaker.
- Division vote.
- Yea and Nay Vote.
- Record Vote.

The paradox of voting, also called Downs' paradox, is that for a rational, self-interested voter, the costs of voting will normally exceed the expected benefits.

In voting, a ballot is considered spoilt, spoiled, void, null, informal, invalid or stray if a law declares or an election authority determines that it is invalid and thus not included in the vote count. This may occur accidentally or deliberately.

2. LITERATURE REVIEW

A reliable electronic election system necessitates that all relevant information be made available, focusing not just on openness but also on privacy concerns. To put it another way, each ballot should be counted anonymously, accurately, and quickly. Some of the researches offered election openness by storing all messages on the Ethereum blockchain, while protecting individual voter anonymity with an efficient and effective ring signature technique.

There were many models that were proposed previously.

- **Open Vote Network** (McCorry, P. et al., 2017)[1] (Hjálmarsson, F., et al., 2020) [4] : Hjálmarsson et al. (2018) presented a smart contract solution for the Ethereum-based Open Vote Network in 2017. They explained that Casting a vote is identical to generating a ring signature in terms of technique. Each vote is produced using the voter's secret key and the public keys of all other voters, and the result can only be computed using all of the votes that have been submitted as proposed by (McCorry et al. 2017) [1] The findings of the implementation suggest that the proposed protocol can be used to run an election with minimum setup, and McCorry et al. want to study the viability of operating a larger-scale election on the blockchain in the future. At a cost of $0.73 per voter, OVN may be easily used for elections with minimal setup. This voting technique ensures maximum voter anonymity and is publicly verifiable, therefore the cost is acceptable. This is the first time a decentralized internet voting system has been implemented on a Blockchain (Gangopadhyay, I. et al., 2019) [6].

- **Follow My Vote** (Hjálmarsson, F., et al., 2020)[4]: Patrick McCorry and his team (2017) explained/ propounded/ established/ demonstrated that Follow My Vote is a non-profit organization situated in Blacksburg, Virginia, that was established in 2012. Hjálmarsson et al. (2018) explained that Voters must verify their identity by using a downloadable application to upload required papers (such as a driver's license). Once a voter's identity has been validated, he or she can request an online ballot and submit it to the blockchain with an unblind token. Because the voters cannot be recognized in the blockchain, Follow My Vote allows for anonymous voting. The central authority that enfranchised the voters, on the other hand, still has a clear picture of the voters. Based on elliptic curve cryptography, this was also achieved in Follow My Vote (ECC). Each voter has two key pairs, one for confirming their identification and the other for voting, allowing them to authenticate their ballots without surrendering their freedom to vote anonymously.

- **Bit Congress** (Chowdhury, A. et al., 2016) [2]: It launched the Bit Congress wallet, AXIOMITY, which allows voters to engage in every facet of the political process. Hjálmarsson et al. (2018) propounded to vote for any candidate, each voter must first construct a bespoke vote token and send it to that candidate's address. A decentralized proof-of-tally is also maintained for each voter, which is updated by an election upon registering the person's vote and is utilized in voter verification (Nofer, M. et al., 2017) [7].

2.1. Challenges in Decentralized Voting System

- **User Identity** (Jafar, U. et al., 2021)[4] : User identity is the distinguishing factor between the users of the product. The previous products just enables the user to register but their real life validation is not taking place.

- **Lack of Support for Cryptography** (McCorry, P. et al., 2017) [1]:There are only some cryptographic algorithms available as of now which could be used for massive scale and also these cryptographic algorithms tends to slow the system.

- **Transactional Privacy** (Jafar, U. et al., 2021)[4]: The ability of a person to own the transactional information of their purchases or transactions is referred to as transactional privacy. This means that no one outside of the two parties would be aware of the transaction.

- **Energy Efficiency** (Jafar, U. et al., 2021)[4]: According to a recent paper on blockchain consensus mechanisms, it can range from 5.5 to 328 watts, depending on the hardware type. The Cambridge Bitcoin Electricity Consumption Index calculates a detailed number for Bitcoin and Ethereum that takes into account the type of mining equipment utilized.

- **Anonymous Voting** (Cuimei, L.,et. Al., 2017)[5]:Due to poll capturing the anonymous voting right of a citizen gets compromised. By leveraging blockchain decentralized voting we can perform anonymous voting.

- **Immatureness** (Jafar, U. et al., 2021)[4]: Due to the short life of implementation of blockchain this technology is still immature and is not implemented in very large scale

- **Acceptableness and Political Leaders' Resistance** (Beha, G.K. et al., 2019)[8] : Due to democratic environment provides exercise to raise their opinion there are chances of conflict within the technology used for voting and hence leads to question regarding acceptableness regarding the online voting system

3. METHODOLOGY3, SETUP AND DESIGN OF EXPERIMENT

The article addresses recent blockchain-based electronic voting research. First, the blockchain idea and its applications are discussed, followed by existing electronic voting methods. Following that, a number of flaws in existing electronic voting systems are found and remedied. The blockchain's potential to improve electronic voting, present solutions for blockchain-based electronic voting, and future research routes on blockchain-based electronic voting systems are all important considerations. Blockchain, according to many experts, might be a natural match for a de-centralized electronic voting system (Wang, C., et al., 2018) [10].

3.1. Algorithms used

We are using Dlib with our Deep Learning model (i.e. FaceNet and VggFace) and Harr-Cascade classifier with OpenCV trainer.

3.2. Types of Databases

There will be two types of databases which we will be using centralized and decentralized. The centralized database will be SQL where user related information will be stored. The decentralized database will be block chain where votes will be stored.

3.3. Dataset

As our researcher team searched in the web and found different sets of datasets some of them are mentioned below:

- Flickr-Faces-HQ Dataset (FFHQ)
- Tufts-Face-Database
- Google Facial Expression Comparison Dataset
- Face Images With Marked Landmark Points
- YouTube Faces Dataset with Facial Keypoints
- Large-scale CelebFaces Attributes (CelebA) Dataset.

In this research project we would try to compare our classifiers using top 100 Bollywood Celebrities as mentioned. The attributes of our dataset image is square shape with 3 channels as for RGB (Red Blue Green) standards. The total size of the data set is around 2GB. This data is available at Kaggle https://www.kaggle.com/havingfun/100-bollywood-celebrity-faces (Pl. refer Fig. 2).

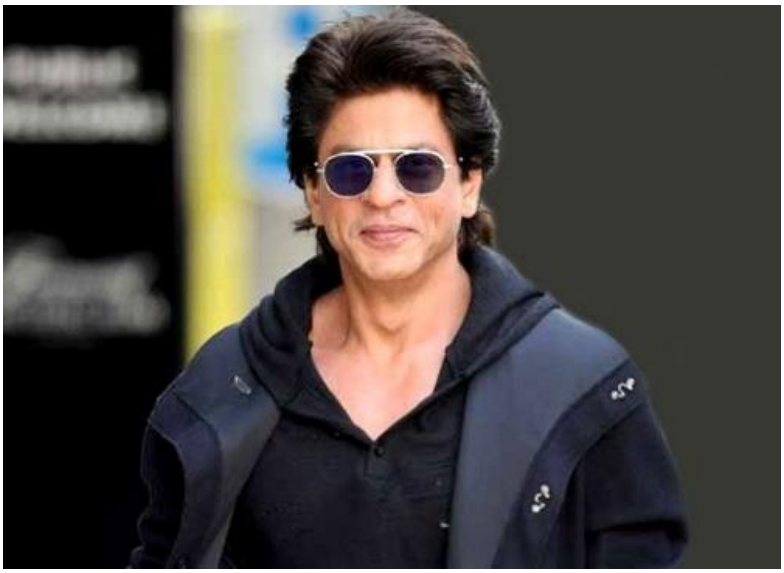

Figure 2. Sample from the dataset

3.4. Hardware Requirement

- For users: Normal phone with basic internet facilities and a front camera is sufficient for our PWA to work on the phone and provide the services we intend to give.
- For development
    - Minimum Intel i5 Processor or similar
    - Minimum RAM 4 GB
    - Minimum 4 GB free secondary storage space.
    - Webcam

3.5. Software requirement

- Ganache: Ganache is a personal blockchain that enables the building of Ethereum and Corda distributed applications quickly. Ganache may be used throughout the development cycle, allowing you to develop, deploy, and test your Dapps in a secure and predictable environment.
    1. Name – Ganache
    2. Mnemonic - A tool for creating a local blockchain for fast Ethereum development.
    3. Specific Number- None
    4. Version Number – Latest
    5. Source - https://github.com/trufflesuite/ganache

- Python 3 supporting IDE (Integrated Development Environment) like Jupyter , Spyder, PyCharm, etc. and its related packages.

- Meta mask extension for Google Chrome
- Remix IDE for Ethereum.

3.6. Network Requirement

A good network connection for signing in and casting vote for the registered candidate applications and dataset files which will be used to train the model and test the model.

3.7. OS Requirement

Windows OS (10/8.1/8/7) / Linux / Mac OS / Android 4.4 / iOS 10. Our application will work on any OS mentioned above.

3.8. Database Requirement

Database is required so that we can easily store the information and can access it later without any problem. The main concept of using blockchain is to have a decentralized distributed. Database which will be immutable and can store the votes and act as a transparent and secure database.

3.9. Storage Requirement

System's storage is required just to store votes and other details to save the data. Also, some storage will be required to run the application.

3.10. Front End and Back End

For the frontend, we are building a PWA which is basically a web app built using frontend technologies like HTML, CSS, and vanilla JavaScript. This web app is lightweight and installable. It can run on any platform which any extra or specific hardware requirement. Also since it is a web app it can be accessed both from desktop and mobile devices and also from any device which has an internet connection. For the backend, we are using Django, which is an open-source web framework based on the Python programming language. Django makes backend development very easy with its ORM and MVT models. Also since it is based on python, it can be easily connected to ML algorithms that are developed in python without the involvement of any extra layer. We are using SQLite as a database. Django provides an engine that can host SQLite database from the Django server only and is not needed to be deployed separately.

The face recognition algorithm used Har Cascade classifier. It is also based on python and used OpenCV library.

3.11. Object Oriented class Diagram

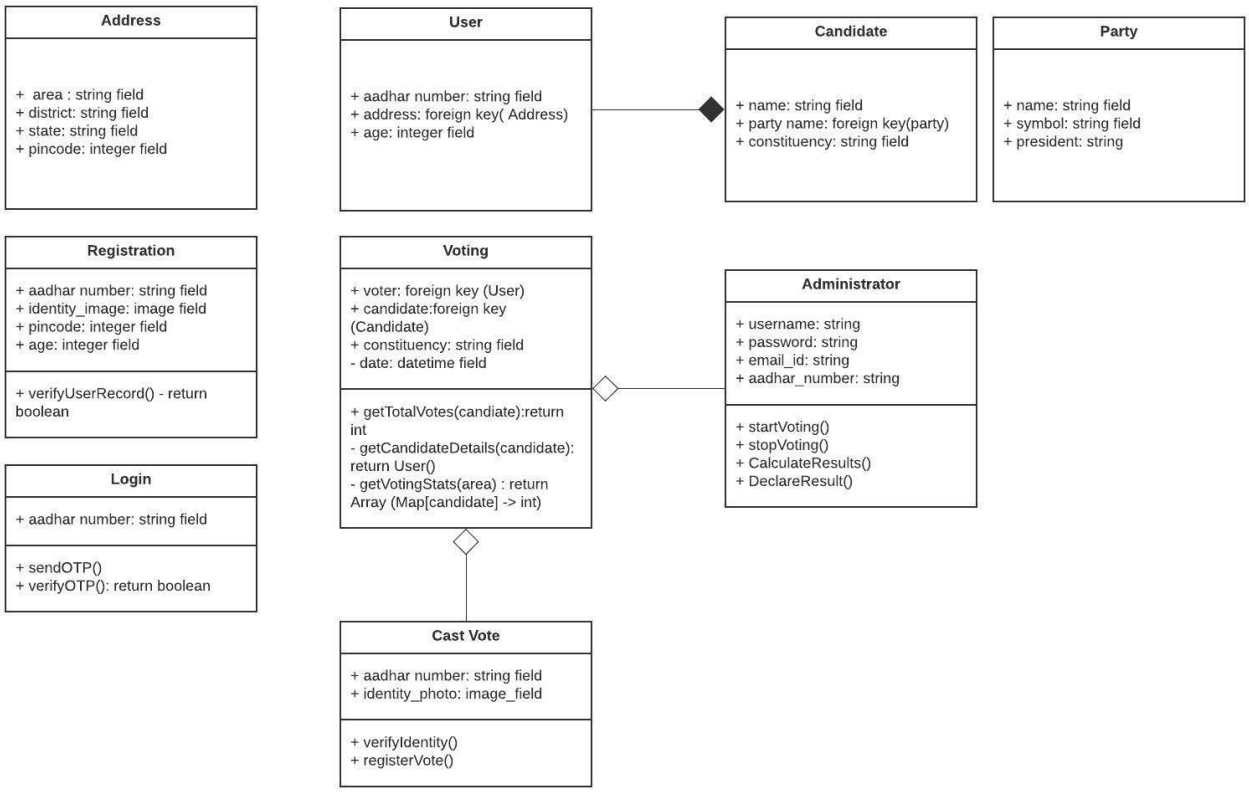

Figure 3. Class Diagram

The above is the class diagram for our system. It will have classes of users, voting, registration, login, etc. It is a graphical representation giving a brief idea about the classes in our system (Pl. refer Fig. 3).

3.12. Data Flow Diagram

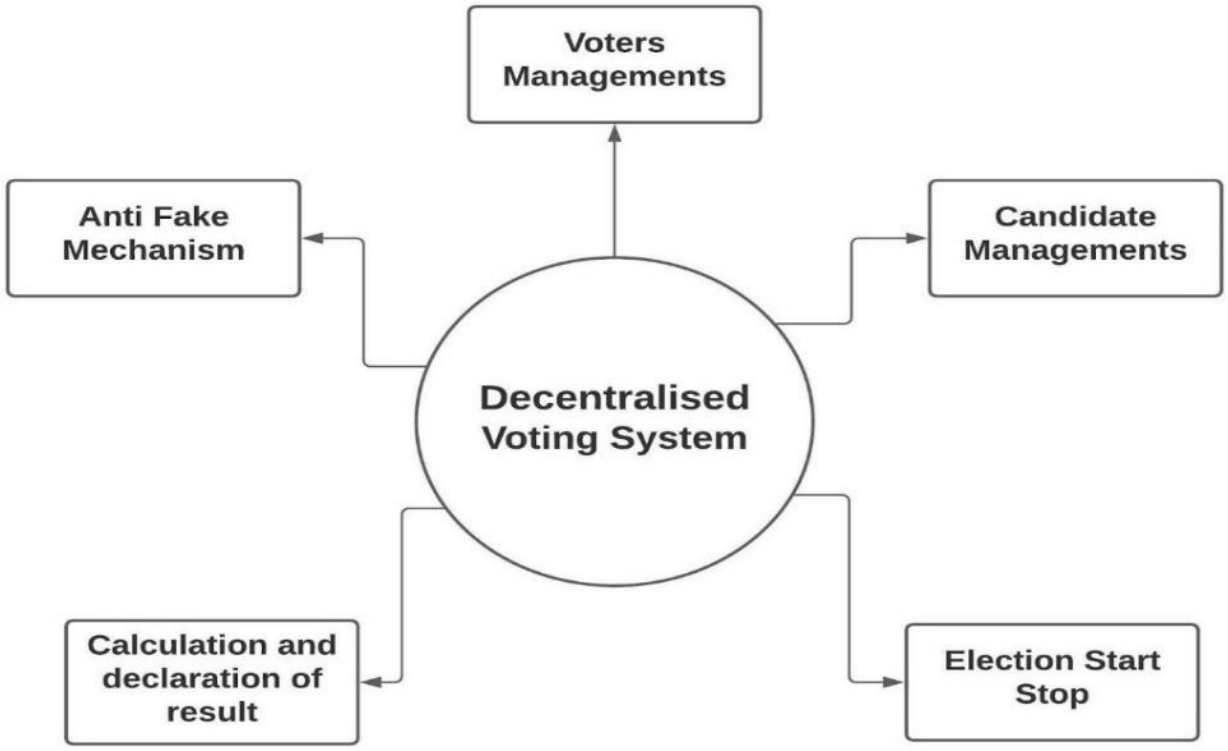

Figure 4. DFD Level 0

The above is the data flow diagram level 0 for our system. The main concept is the decentralized voting system and features like voters management, candidate management etc. revolves around the voting system (Pl. refer Fig. 4).

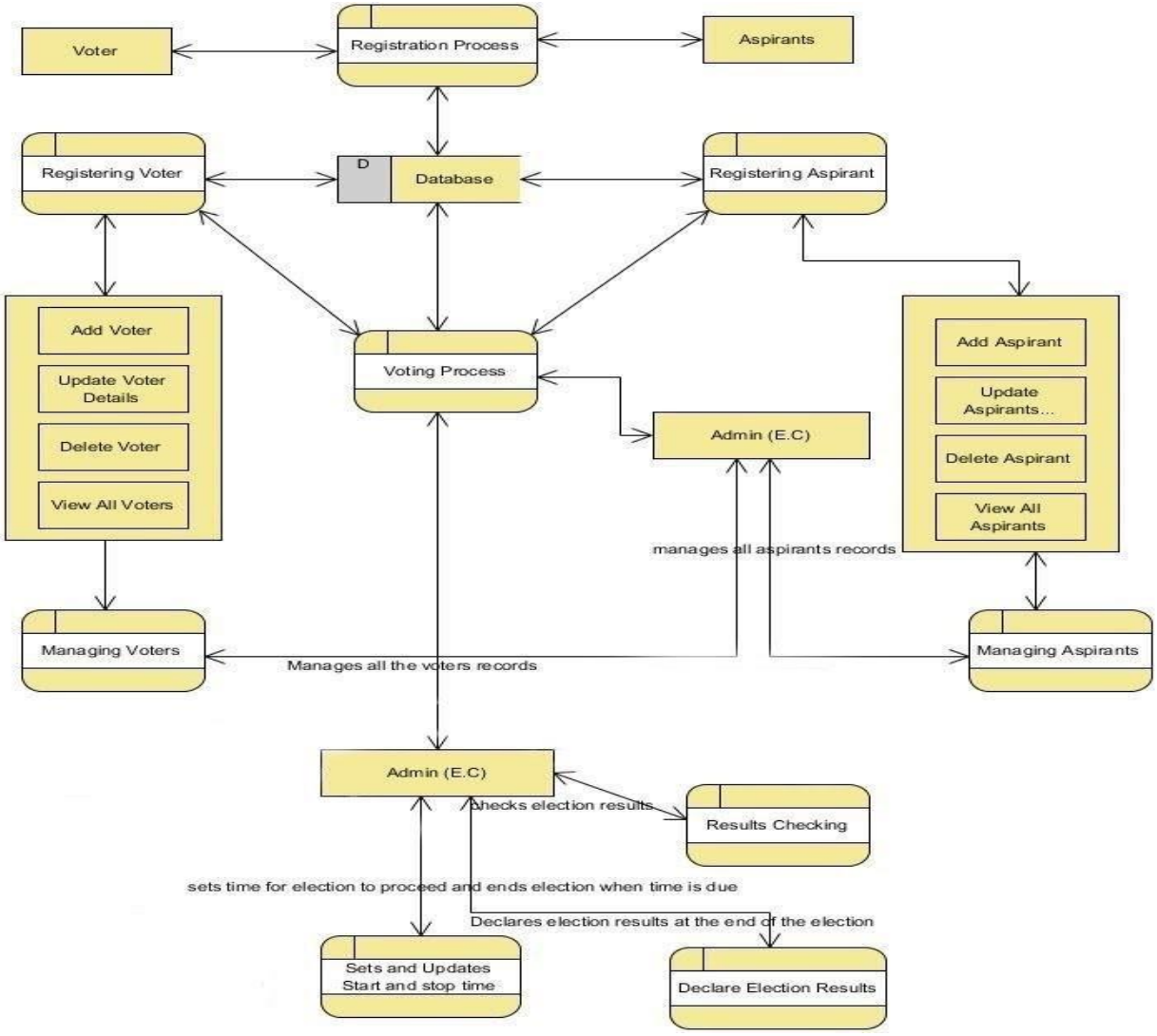

Figure 5. DFD Level 1

The above is the data flow diagram level 1 for our system. This gives us some detailed structure of the data flow within the system. The main process including voting, admin panel, result declaration, etc. And their connection with the database (Pl. refer Fig. 5).

3.13. Use case Diagram

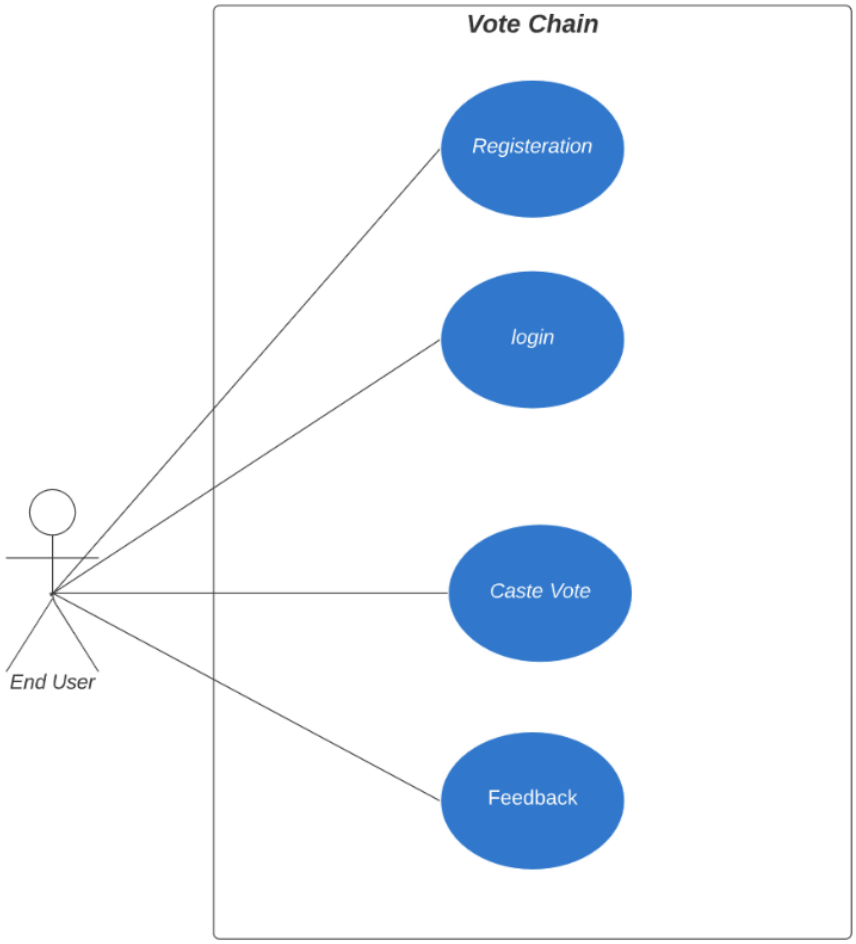

Figure 6. Use case diagram for end users

The above is the use case diagram for our system. This diagram gives a brief idea about the cases with respect to the user as the user can register, login, cast vote and give feedback (Pl. refer Fig. 6).

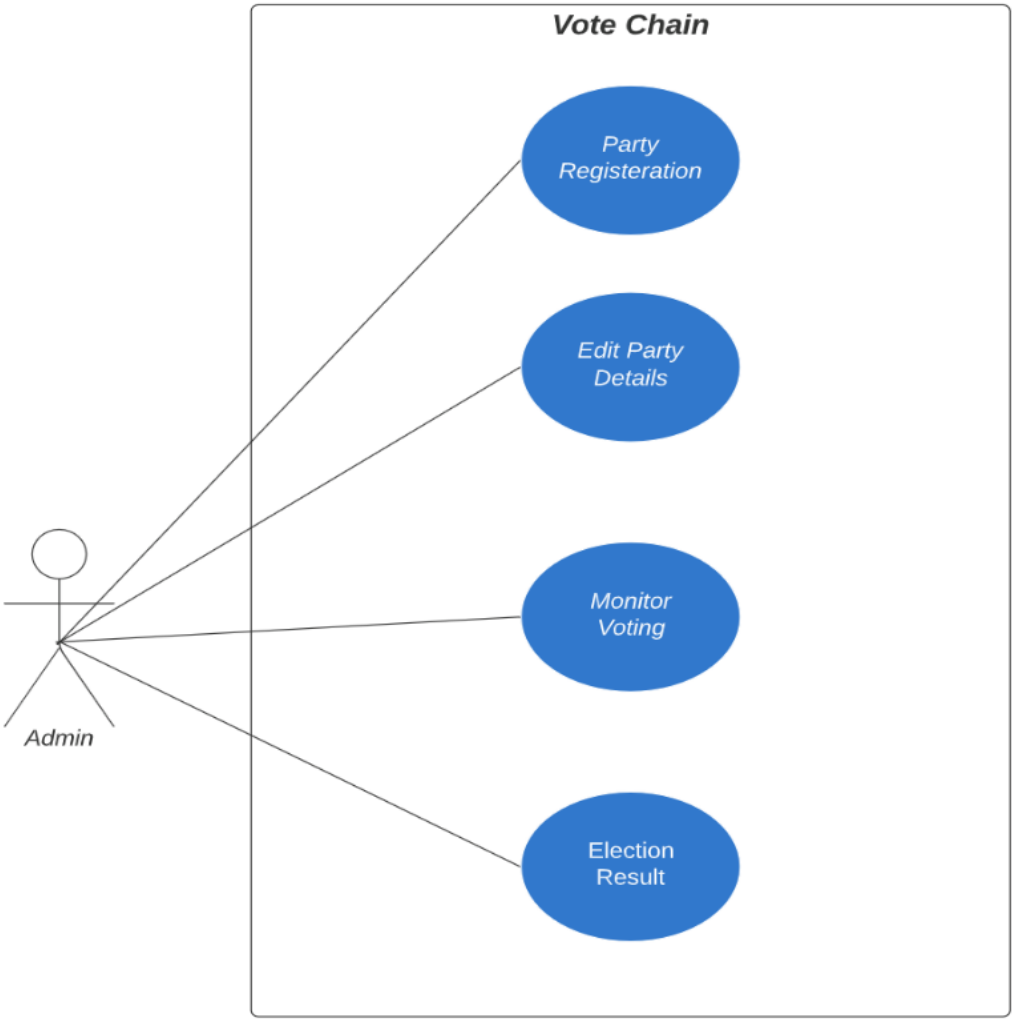

Figure 7. Use case diagram for admin

The above is the use case diagram for our system. This diagram gives a brief idea about the cases with respect to the admin. The admin can register a party, monitor the voting, see the results (Pl. refer Fig. 7).

3.14. Process Diagram

Figure 8. Process Diagram for Admin

The above is the process diagram for the admin side of our system. The admin can register the candidate of the party and create the block (Pl. refer Fig. 8).

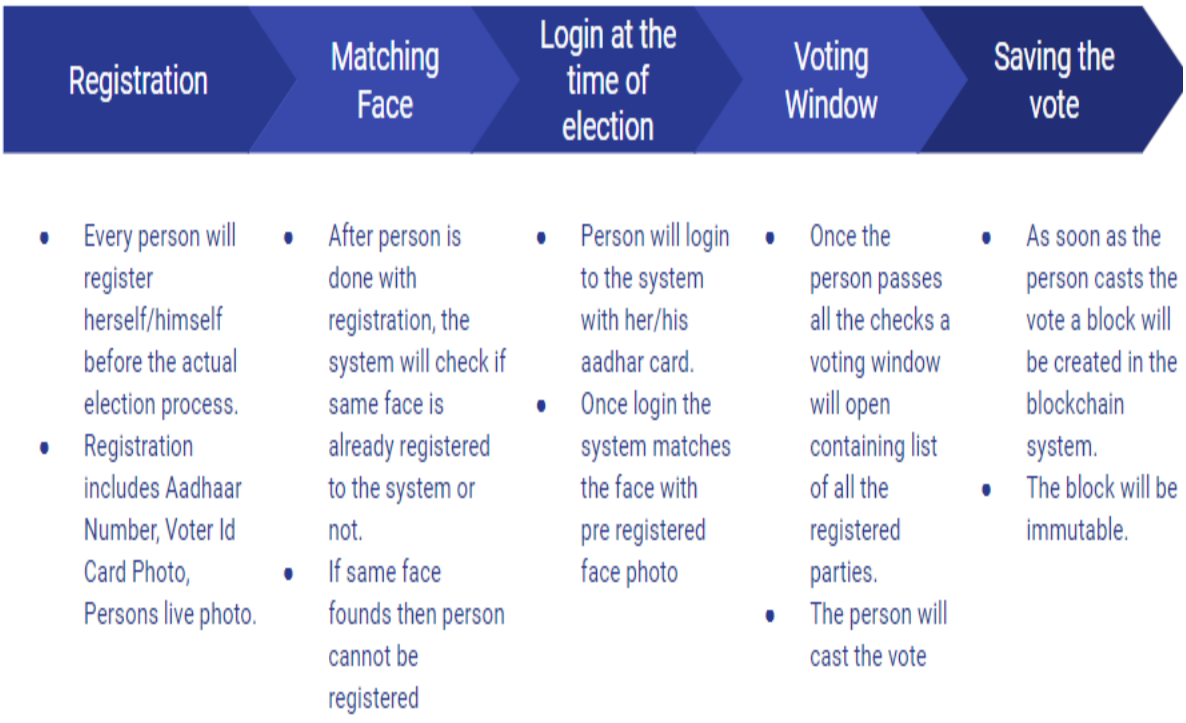

Figure 9. Process Diagram for User

The above is the process diagram for the user side of our system. The user can register himself to the system and goes on the ML process for face recognition process, After the registration is over she/he can cast vote at the time of voting (Pl. refer Fig. 9).

3.15. System Design

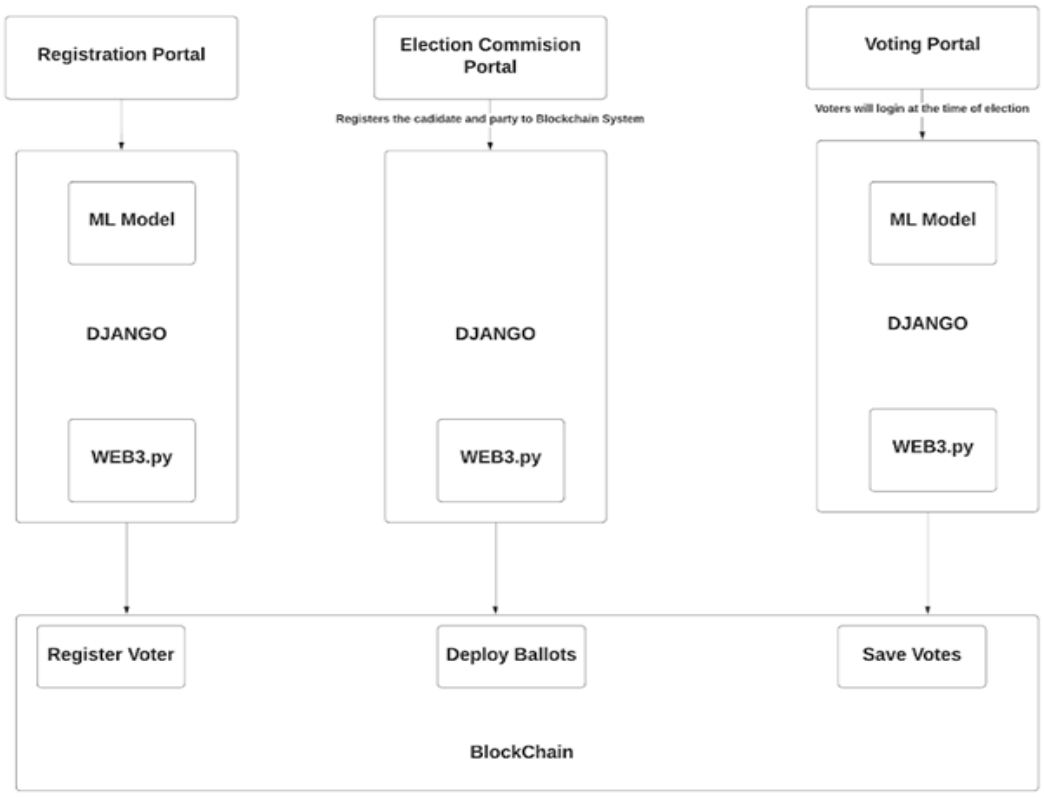

Figure 10. Process Diagram for User

The above is the system design of our system. We mainly have three process registration portal, admin portal and the voting portal. Depending on the needs the technology came into action (Pl. refer Fig. 10).

3.16. Flow Chart

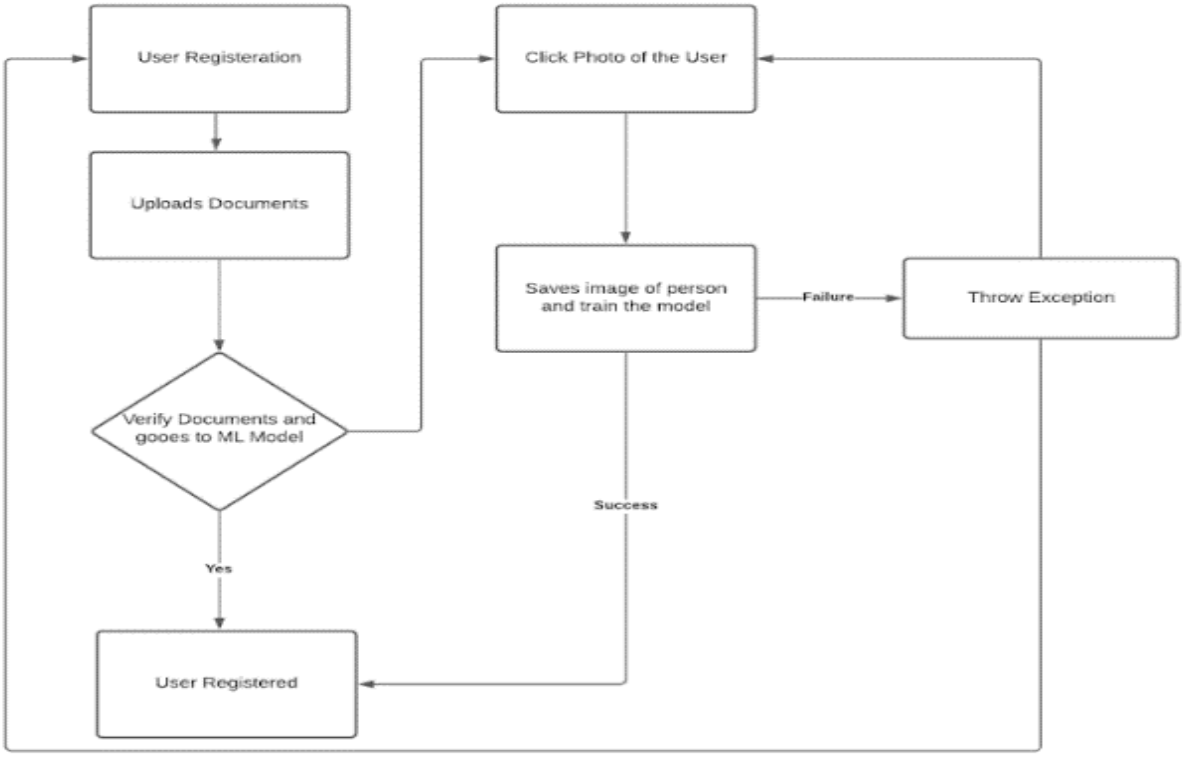

Figure 11. The Flow-chart for registration process

Following is the flow chart for the process adopted by researchers' team. This flow chart contains the overall flow of the registration process of the system containing the backend the ML algorithm and the blockchain with our frontend (Pl. refer Fig. 11).

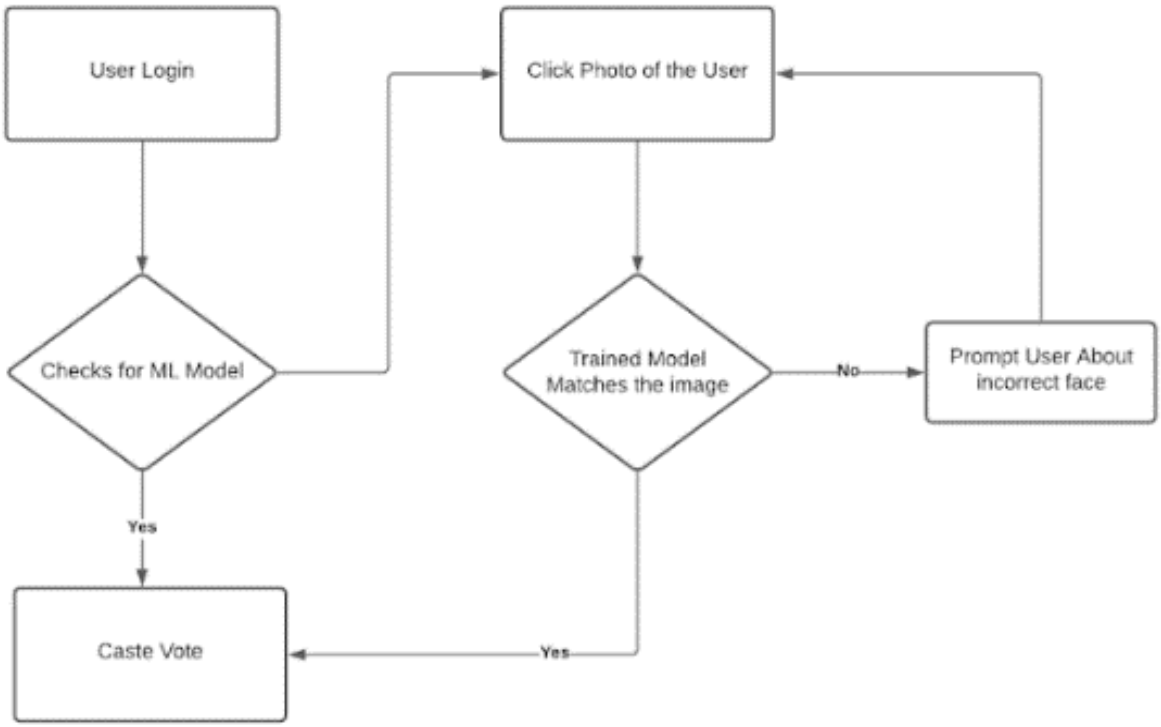

Figure 12. The Flow-chart for voting process

Following is the flow chart for the process adopted by researchers' team. This flow chart contains the overall flow of the voting process of the system containing the backend the ML algorithm and the blockchain with our frontend (Pl. refer Fig. 12).

4. RESULTS AND DISCUSSIONS

Results that are shown below are comparing various component to be applied in our product since we have to look at larger perspective so that our product is reliable enough to be implemented at larger scale. First we have looked at the face recognition part which is integral for the user verification for voting purpose. Second is our blockchain structure implementation as it should be efficient enough for storing our votes and utilizing its features. Third we have combined both in a backend and performed load test to understand how can we scale to build at larger perspective (Pl. refer Fig. 13).

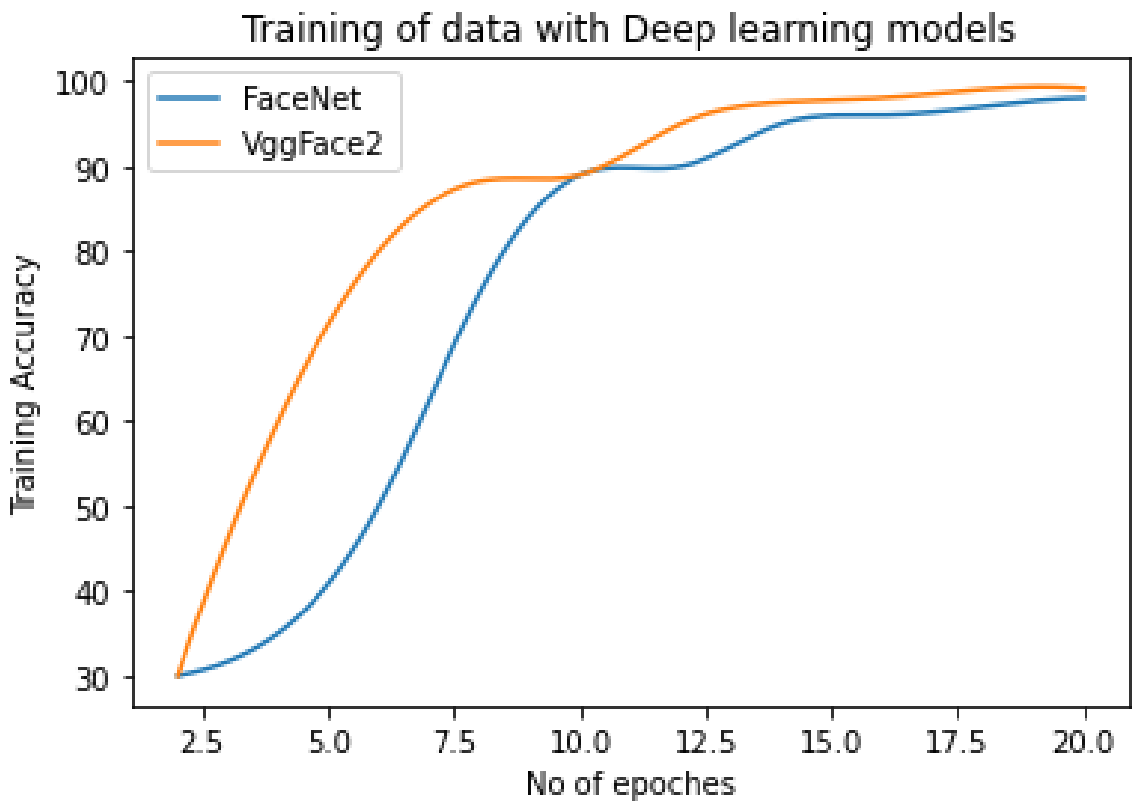

Figure 13. Training deep learning models and monitoring accuracy with respect to their epochs

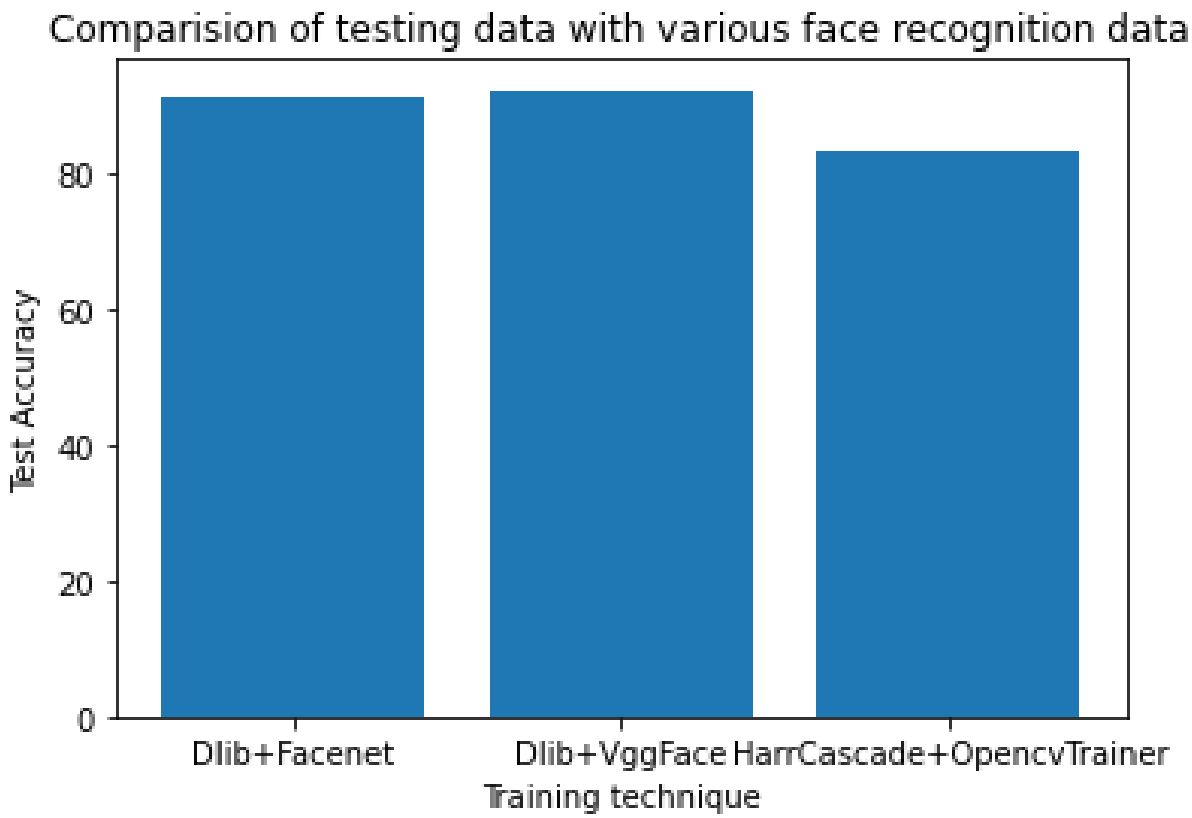

Figure 14. Comparison of face recognition techniques

Author team tried to train our deep learning models along with Dlib to see which model is working better with the dataset provided and was found that FaceNet was working well but during testing phase we found that VggFace was having higher testing accuracy as compared to deep learning model and HaarCascade+OpenCV trainer. But in our project we would choose Haar cascade despite the fact that well-trained CNNs can learn more parameters (and so detect a wider range of faces), Haar-based classifiers are faster (Pl. refer Fig. 14) [9].

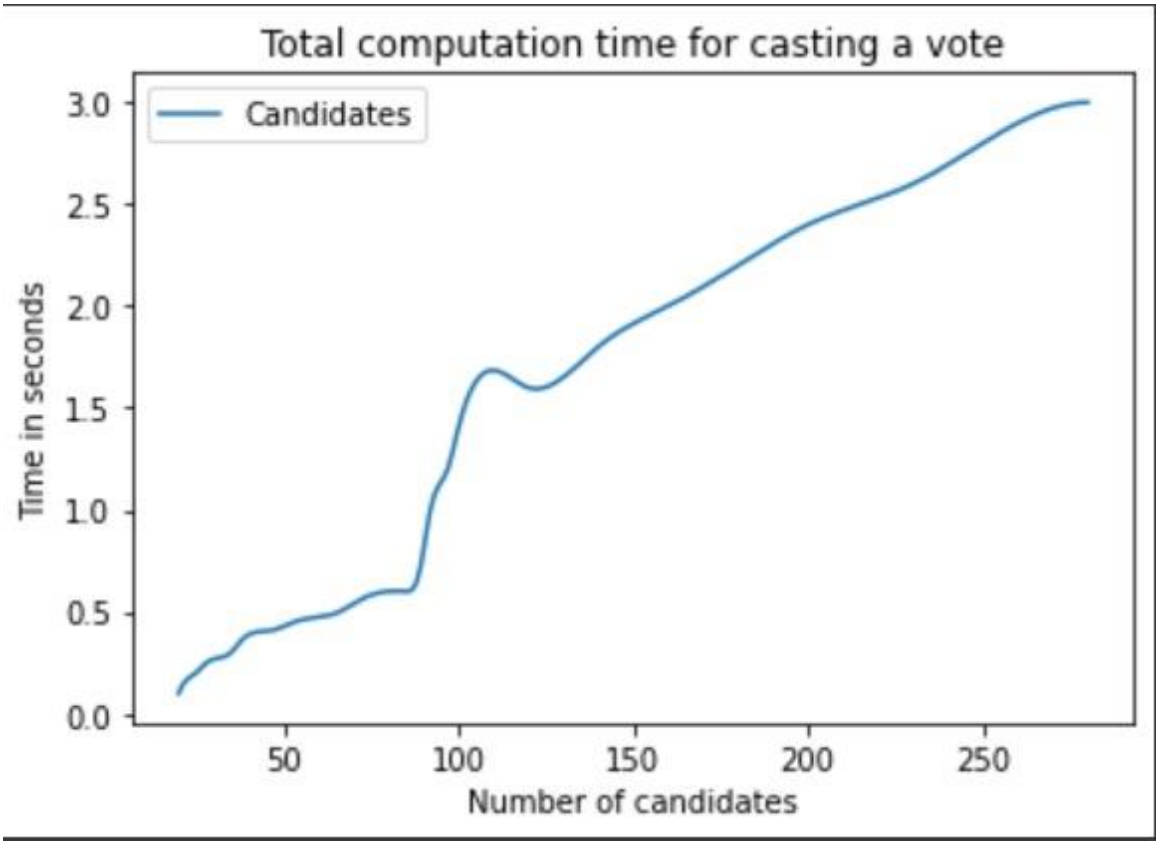

Figure 15. Performance Evaluation of the blockchain architecture

The following graph shows the computation estimate of total time spent when a vote is cast with respect to the increasing number of candidates. The x-axis represents the number of candidates/voters who cast votes simultaneously and the y-axis represents the total running time in seconds for casting a vote (Pl. refer Fig. 15).

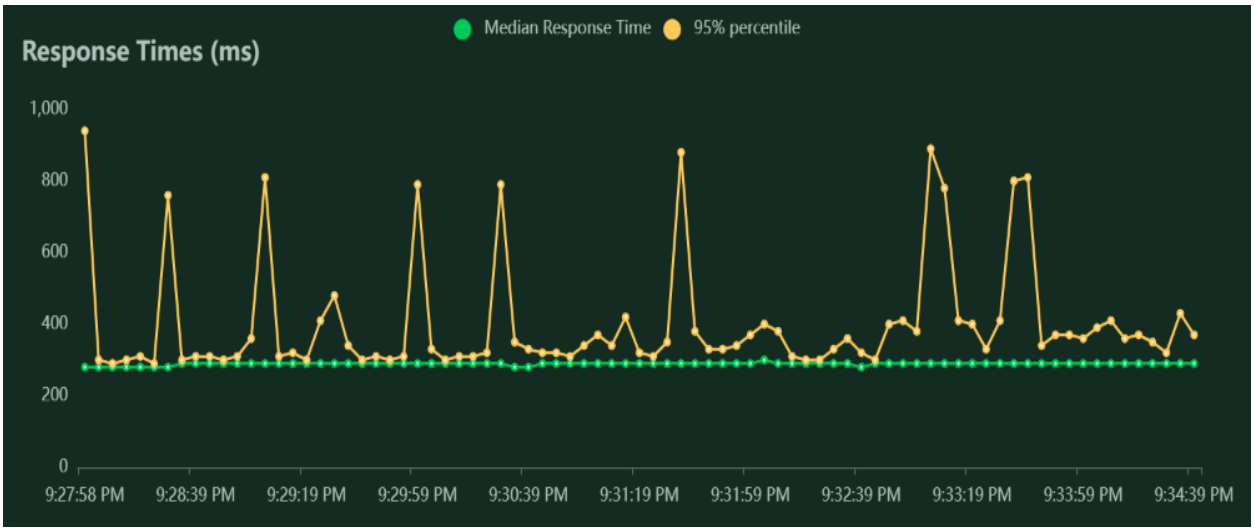

Figure 16. Performance Evaluation of backend (after integration of ML and Blockchain)

The graph above shows us the load test of our backend. The X -Axis shows us the time of the request made and the response received. The Y-Axis shows the response time took in milliseconds. The yellow line in this graph shows that 95% of the total response took the time equal to less than the value corresponding at Y-axis and the green line and the green line shows the median time the request took at the corresponding X-Axis (Pl. refer Fig. 16).

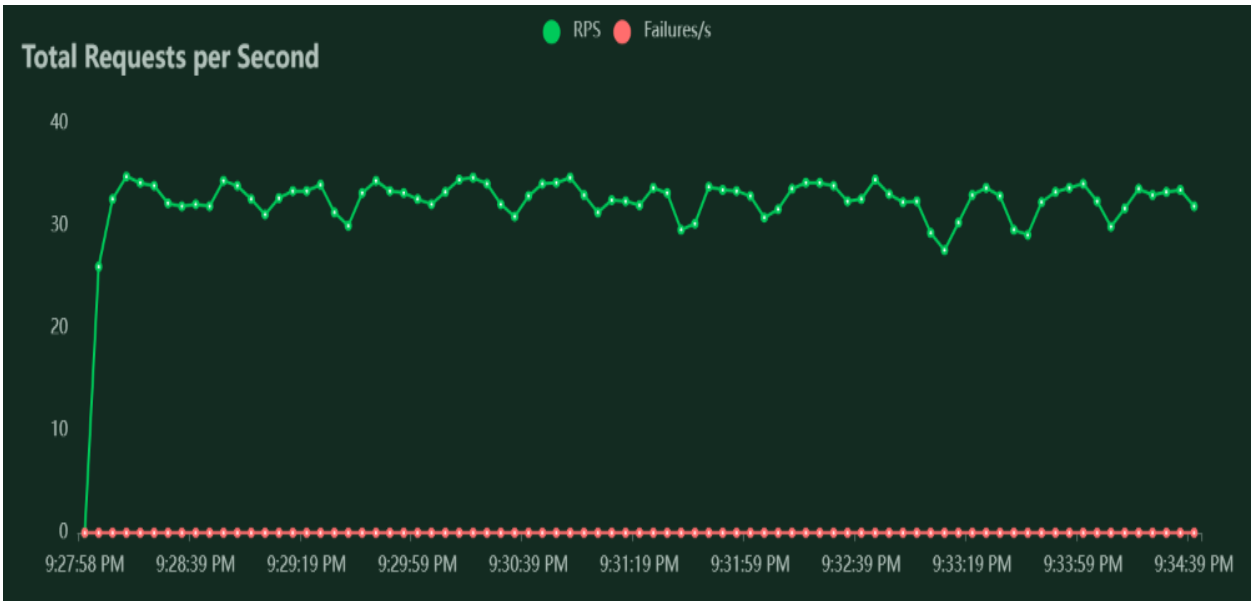

Figure 17. Graph of the Successful / Failure Request Per Second

The above graph shows the request made per second with respect to the successful and failure requests. The most promising part here is that we didn't get even a single request for the failure

side which means that we can shift it to production side which would enable us to achieve the main aspect i.e. providing our product to lower tier cities and villages of the country (Pl. refer Fig. 17).

5. NOVELTIES

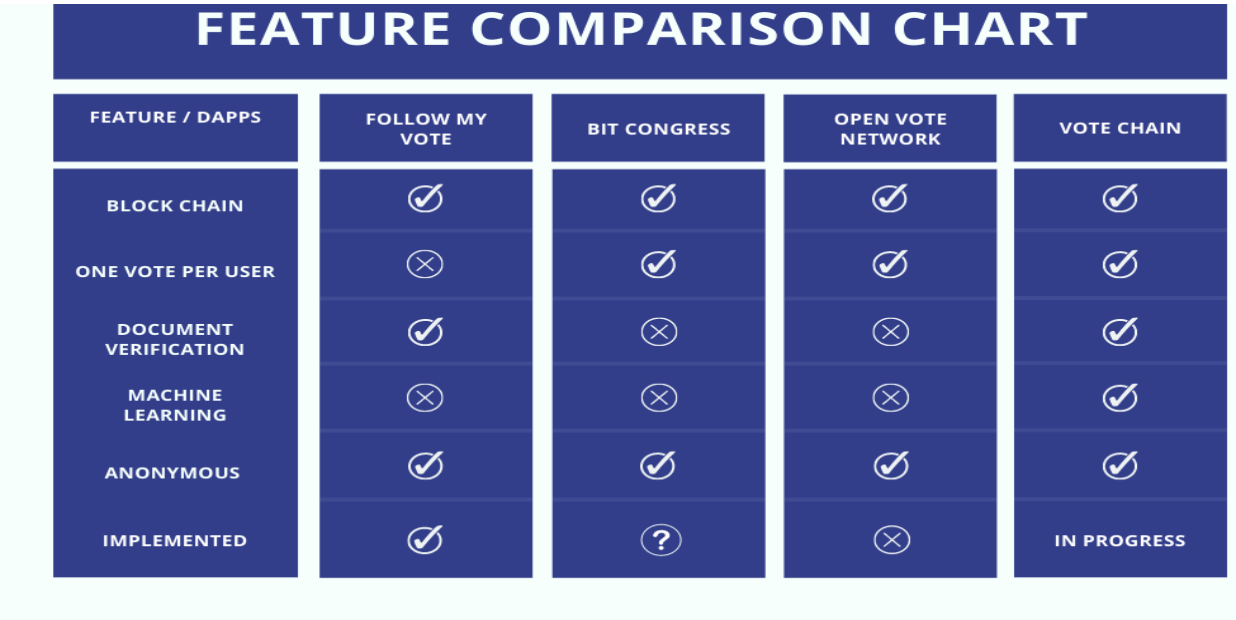

Figure 18. Feature comparison Chart

- **Blockchain**: These products uses blockchain for storing of the votes made by the citizen.
- **One vote per user**: This means that the only the registered user can vote only once and this can be monitored by the product.
- **Document verification**: This means the valid document for proof of identity is used to verify the credentials of the users. This can also be done by integration of government approved API's.
- **Machine Learning**: Machine Learning algorithms is used to verify the existence of the user's presence at that particular position
- **Anonymous**: This means that the user's voting is captured then its identity is not known to anyone like for example who did it and how the user did.
- **Implemented**: Whether the project has been implemented in real-time or not.

This research is made to capture all these aspects and make the research novel in nature (Pl. refer Fig. 18)**.**

6. RECOMMENDATIONS

Blockchain based voting system can be used for voting process as it will make it more secure, transparent and easy. As privacy of people is a big issue in online world this system can be used to conduct vote without compromising with the privacy of the users. Booth capturing can also be reduced using online voting system. One person one vote can be ensured by using biometric system for authentication. A light weight PWA application will also ensure every person with a internet connection and a smart phone can cast their vote.

Robust and Hack Free System with Varying Complexity

A block chain's decentralized nature means that its network is distributed across multiple computers known as nodes. This eliminates a single point of failure. In other words, there is no way to "cut the head off the snake" — because there isn't any head.

On one hand, bitcoin itself is very difficult to hack, and that is largely due to the block chain technology which supports it. As block chain is constantly being reviewed by bitcoin users, hacks are unlikely.

7. FUTURE RESEARCH DIRECTIONS AND LIMITATIONS

7.1. Limitations

This manuscript is based on many theoretical aspects of blockchain technologies and is implemented on a very small user base so the scalability of the product to a large scale is still an issue.

Since a block creation takes some time so running the project on a very large population is an issue as the number of concurrent transaction is limited. The political resistance to any new product is eminent and it will take some time to convince everyone to use the product.

So building trust related to product will take a long time. Since the product is only available as a web app it may not be convenient for all people to use a website for voting purposes.

Possible Limitations of the System are

- Lack of Awareness. There is a lot of discussion about Block chain, but people do not know the true value of Block chain and how they could implement it in different situations.
- Limited availability of technical talent.
- Immutable.
- Key Management.
- Scalability.
- Consensus Mechanism.
- System Robustness n Accuracy
- Full testing and error proofing

- Right User Identity verification
- Lack of Support for Cryptography
- Transactional Privacy
- Energy Efficiency
- Anonymous Voting
- Acceptability
- Political Resistance
- Policy framing and programming as per Indian standards

7.2. Future Directions

The next implementation should be conducted on a large scale and many areas at same place to test scalability of the product. More research is needed to build a system where transaction speed can be increased to reduce time taken to cast the vote and concurrent transaction limit can be increased. To build a mobile app for the product so that it can be adopted by more group of people according to their convenience. Our results motivate us in the sense of achieving this particular aspect.

Effect of room Lighting can be addressed and recognition of person with injury, face distortion or glasses, beard or mask has to be rightly identified and it will be a challenge.

8. CONCLUSIONS

The product was build and the author team were able to implement the novelties they have discussed above. The voting process was tested with a small group of people. Their data was stored and the voting process was opened for the. The voting was conducted smoothly without any difficulties. From this, one can also conclude that this system can be introduced for voting process of countries with rigorous scalability and security testing. The ML system can help in checking the integrity and authenticity of the user and can solve the problem of fake voting.

9. ACKNOWLEDGEMENTS

The Author Team pays their respects to God. They then thank each of their parents for everything they have done for them. They then express their sincere appreciation to Dr. Pratibha Singh, ex-professor in ABES Engineering College, Ghaziabad which helped us during the development of the project. We also offer our special thanks to ABES management, Director ABESEC, HoD ECE, HOD CSE and all other senior Coordinators for their extraordinary support to our team. In the end, we pay our due respects and thanks to each and everyone involved, direct or indirect in this work.

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ANNEXURE

Additional Readings

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Key Terms and Definitions

Blockchain: A blockchain game is a video game that includes elements that use cryptography-based blockchain technologies. Blockchain elements in these games are most often based on the use of cryptocurrency or non-fungible tokens which players can buy, sell, or trade with other players

Online Voting: Online voting is an election system that uses encryption to allow a voter to transmit their secure and secret ballot over the Internet.

Face Recognition: A facial recognition system is a technology capable of matching a human face from a digital image or a video frame against a database of faces, typically employed to authenticate users through ID verification services, works by pinpointing and measuring facial features from a given image.

Proof of work: Proof of work is a form of cryptographic proof in which one party proves to others that a certain amount of a specific computational effort has been expended. Verifiers can subsequently confirm this expenditure with minimal effort on their part.

Proof of stake: Proof of stake protocols are a class of consensus mechanisms for blockchains that work by selecting validators in proportion to their quantity of holdings in the associated cryptocurrency. This is done to avoid the computational cost of proof of work schemes.

Ethereum: Ethereum is a decentralized, open-source blockchain with smart contract functionality. Ether (ETH or Ξ) is the native cryptocurrency of the platform. ... The platform allows anyone to deploy permanent and immutable decentralized applications onto it, with which users can interact.

Block in Blockchain: Blocks are data structures within the blockchain database, where transaction data in a cryptocurrency blockchain are permanently recorded. A block records some or all of the most recent transactions not yet validated by the network. Once the data are validated, the block is closed.

Data Sets (snapshot)

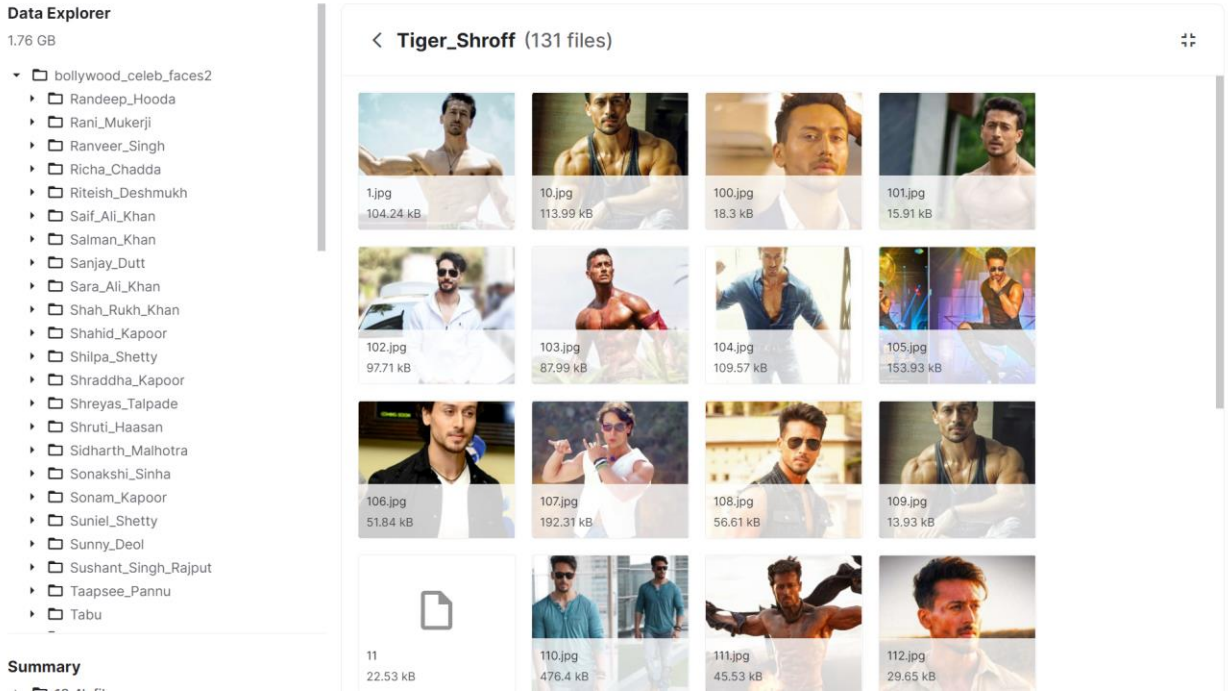

Figure A. Sample Dataset: Feburary 2022

Code Snapshots

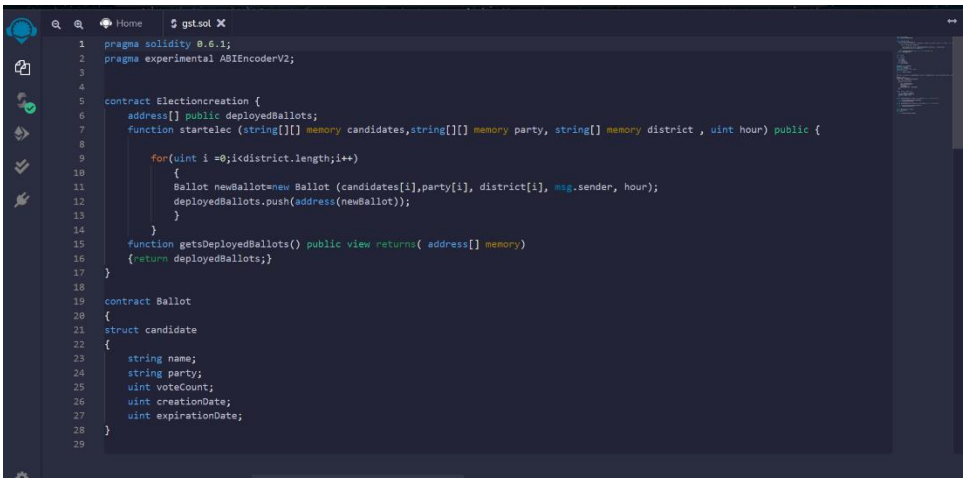

Figure B. Smart Contract for Voting Ballet

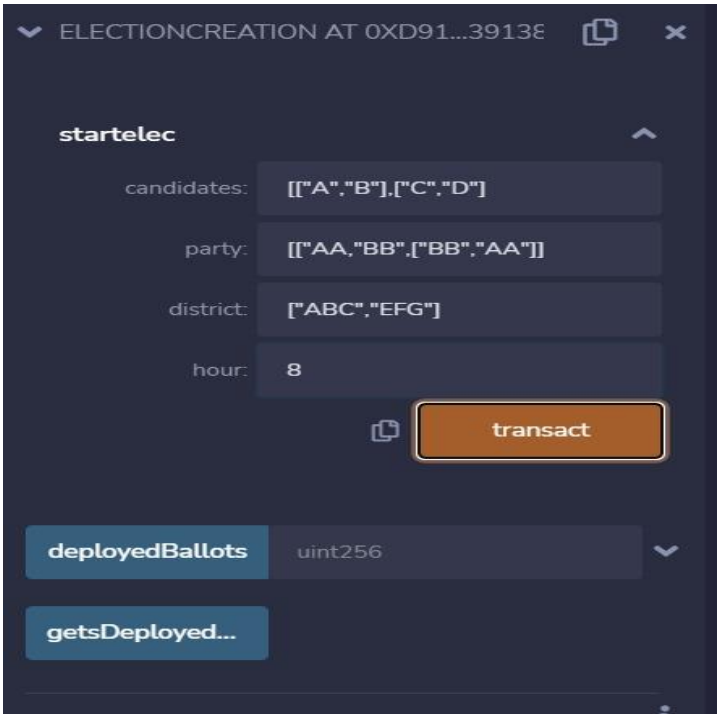

Figure C. Deployed Smart contract

Authors' Profile

Dr. Rohit Rastogi received his B.E. C. S. S. Univ. Meerut, 2003. Master's degree in CS of NITTTR-Chandigarh from Punjab University. He received his doctoral degree from the Dayalbagh Educational Institute in Agra, India. He is serving as an Associate Professor in the CSE department of ABES Engineering College, Ghaziabad, India. He has won awards in several areas, including improved education, significant contributions, human value promotion, and long-term service. He keeps himself engaged in various competition events, activities, webinars, seminars, workshops, projects and various other educational learning forums. He has guided around 40 B. Tech. students' projects and 5 M. Tech. Thesis. He is editor and reviewer member of several international Journals and conferences. He has 100+ publications in journals and conferences of International repute. He strongly believes that Transformation starts within self.

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Mr. Rajat Srivastava is pursuing B. Tech from ABES Engineering College Ghaziabad. He is currently in final year of his Engineering degree. He has a strong knowledge about technologies used in web apps and mobile apps development. He is also enthusiast about Blockchain technology. He is currently working in Edtech startup where he works as a backend developer. He has a keen interest in learning new technologies. In his free time he contribute to open source.