

Smart Voting System using Deep Learning Techniques and Facial Authentication

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Abstract:- The most common method of voting system followed in our Nation is secret ballot paper voting system and Electronic voting machine system. Electoral fraud activities is said to be the most illegal intrusion of voters and they are voting repeatedly for their favourite party. This in turn causes vote sharing. Taking necessary steps upon identification and prevention of fraudulent activities is essential. But, both of this conventional method of voting system is not enough to detect and identify multiple times of voting by a person in different identity. To improve the standard of voting system and avoid those kind of activates, this paper proposes a novel approach. The proposed system adopts a two level authentication technique. At first, the registered user data is submitted in login page and then user are verified by face authentication and One Time

Password (OTP) system; in next stage, the counting of vote is held by verifying the admin with OTP and then directing towards result section. This is the way; the two level verification stages are processed in this proposed *framework*. For this approach, Local Binary Patterns (LBP) cascade classifier approach is integrated with

Convolutional Neural Network (CNN) is used to perform

face authentication. The proposed system is possible to ensure security in a more successive rate and avoiding vulnerabilities in conventional method of voting system.

Keywords: *Ballet Paper Voting System, Electronic Voting Machine System, Electoral Fraud, One Time Password (OTP) System, Face Authentication, CNN Classifier Approach, LBP Cascade Classifier.*

I. INTRODUCTION

Election is the fundamental process of a constitution and which will makes a citizen to show their opinion about every party leader in the form [1]. The nation spending a lot to improve the process involved in election to ensure better government to citizens of India. There would be a lot of chance for electoral

frauds to cheat during election. In India 912 million people can have eligibility to vote and select their ruler. It was around 67% of voters who likely to be vote and does their democratic duty. Important claims of fraud in 2006 included presidential elections in Mexico and the presidential election in 2000, when charges of electoral manipulation in Florida were discovered around the world. The electoral officials are struggled a vast to control and identify electoral fraudulent in a huge number. From past, the stuffing of ballot boxes with papers by voters is continuing [1-2]. It requires lot of man power to organize it

and takes more time to arrange it. And this scheme is less trustworthy. Recently electronic voting machine is widely used [3]. Defendants on the losing end of elections are frequently claimed that the machines might be hacked and ballots falsified. Some other fraudulent activities encountered in traditional method of voting are fake counting of votes, putting duplicate votes, falsify machines, etc. This is the root cause for introduction of smart voting system [4]. Moreover, the election conducting body, Election Commission of India (ECI) uses Electoral Voting Machine (EVM) to make a person posting their votes which was comfortable for conducting election in a short period with less energy consuming process [6].

But it is unsuitable for everyone. Before and after election there is huge need of transportation. Before election, the election commission needs to arrange staff to arrange and fix EVM in appropriate booth and after election it is essential to arrange protection force to keep voting machines safe and secure. The machine

has to be maintaining regularly and to fix if any issues observed with in it. There need to a huge expenditure for transportation. The proper care upon EVM machines and maintenance of it is must. To concentrate upon above mentioned problems and bring an instant solution, a novel approach is presented in this paper. The proposed system utilizes face recognized voting

system. The usage of LBP classifier approach

integrated with Convolutional Neural Network (CNN) performs image recognition [6]. This voting system possesses a camera to capture a person who is voting. It is more convenient and suitable for persons living in a different locality or moving towards some other countries for their work; it avoids the need for queues and waiting time to post their votes. This system allows everyone to vote and identification of fake

voting is easier than conventional approach. The

confirmation of appropriate voters are done with the help of OTP verification system is included in recommended system. The web based voting approach is less expensive than EVM and it utilizing minimal amount of manpower to organize it. Following introduction, the section II dealt with several other research works in voting and measures involved in preventing or blocking fake voting. The section III dealt with difficulties in IoT based blockchain voting

system. The processing of IoT device in register and count votes with prevention of electoral frauds with blockchain approach is described.

The explanation of proposed block diagram and the process involved in user section such as registration, logging in, OTP and face authentication kind of verification, voting and viewing result is presented; admin section portal verification with managing voter data with result of it are defining in this section. The effectiveness of selected classifier algorithm to

perform face authentication is explained well. The face authentication with posting their voting and viewing result of every party is reviewed in section IV. The system is concluded with its advantages and requirement of this technology in future is represented in section V.

II. RELATED WORKS

The authors of [8] proposed a novel database-based recording system with a high level of integrity. This could be used in the event of a malpractice attempt. The Advanced Encryption Standard (AES) is utilised to encrypt this data. It is six times faster than the standard triple DES algorithm. The voters and administrators are granted public and private keys under this scheme. Voting has taken place as a result

of this procedure. Every new idea should address a human need in some way. There is a pressing need to increase the use of innovations. Few individuals nowadays have lost faith

in their administrators. As a result, the new unique voting method must have a high level of accuracy and confidence in order to reintroduce individuals to the voting system [7]. For improved security, Shalini Jindal et al. developed a block chain-based e-voting system in [9]. They looked at a variety of block chain-based e-voting methods. The authors have looked at a variety of criteria to increase the security of block chain. In [10], R.Osgood examined the different challenges and flaws with the traditional voting system. The author looked at many sorts of voting machines. Finally, the author came to the conclusion that

Electronic Voting Machines (EVMs) are vulnerable in a variety of ways. As a result, he highlighted why a block chain-based voting mechanism is required. After reviewing numerous voting system implementations,

the author developed a new secure and efficient

approach. The Electronic Voting System is made up of several processes, such as casting votes and then tabulating the results. Nowadays, a wide range of voting applications is available. One of the most extensively used voting systems is the Direct Recording Electronic System with Internet Voting. Three devices are required to implement this system. The total system implementation includes touch screen

machines, punch key machines, and wheel machines. This type is really easy and user pleasant one. However, it has a number of security concerns, which are discussed.

Dipali Pawar et.al [11] utilized blockchain based E voting system. Thus system subjects to avoid fake voting and provides a framework for verification. The decentralised system allows user to change their votes within in a given time period. In [12], Francesco Fusco suggested a voting system so called crypto voting system or e-voting system. For security purpose block chain technology is utilized. This system integrates phase and event of voting system. Event involves setting up of the system, sharing of credentials, register vote, ballot paper collection, vote count, result announcement and

several other processes. The recommended system tries to trace and audit this process without any intermediate person. In [13], Sikha Bagui et al. presented several data mining strategies for examining likely voting trends in

the US House of Representatives. The authors also demonstrated how findings might be interpreted based on various parameters. They used <http://clerk.house.gov> to gather raw data. Attribute selection, association rule mining, decision tree analysis, and interpretation of interesting outcomes were all part of their research. Y. Subba Reddy and P. Govindarajulu [14] addressed machine learning approaches in [8], which will help to explain the evolution of contemporary vote recommendation systems. In order to overcome the constraints of the current system, the authors offered new user-centric preferences. It will also contribute to

increased recommendation system reliability and

dependability. By computing weight for user views and rating, this new method can be embedded. In [15], Dinesh Kumar et al. introduced a novel upgraded ensemble classification algorithm that uses a new voting strategy to merge several classifiers. After

applying several classifiers and selecting the best classifiers, the final ensemble is created. Association and ensemble principles are used to improve the performance of ensemble classifiers.

In [16], Gopala Krishnan et al. developed a new

enhanced reweight mechanism in ensemble, which they claim will produce better results than single classifiers. In the initial iteration, use single classifiers such as decision trees and naive Bayes. After the first iteration, determine the number of correctly classified and misclassified cases in each class. Now, based on the previous iteration's findings, calculate fresh weights. Finally, in subsequent iterations, learn deep

networks based on the ensemble. From above observation, a clear view about e-voting system has obtained. To resolve drawbacks in several

other systems and to improve the security protocols the proposed method is designed. This proposed system could replace the use of EVM and difficulties in it.

III. PROBLEM IDENTIFICATION

The conventional method of voting is done with Blockchain and IoT based hardware setup. The use of IoT device is to register and collect the vote. IoT hardware setup is either legitimate or malicious. If a system is observed as malicious, the possibility of adding that system with blockchain is more difficult. The major drawback of IoT system is security and privacy. Receiving the necessary details of voters and storing it in a local storage system is the difficult task for election commission; the cost expensive system may require additional maintenance; a technically well knowledge person is essential for computing and connecting hardware with software network and makes the hardware to react with software system. In case any failure occurs in the hardware portion, there is impossible to perform essential functions with software section alone.

IV. METHODOLOGY

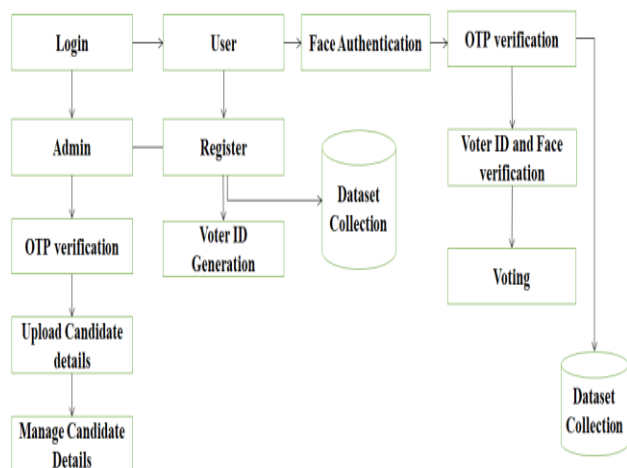


Figure 1 Overall architectural diagram of proposed system

The generalized structure of proposed block diagram is shown in figure 1. The proposed system has two-level of verification for voters and a level of verification for admin officers (i.e. Election commission officer). Before voting, the user need to verify their registered mobile number and after that face verification is

important to further processing of voting. To perform face recognition, the proposed system utilized LPB cascade classifier algorithm with CNN approach. For admin, OTP level verification is enough. Normally, a person with age above 18 can have the eligibility to vote. For them the registration process is must. In general, the proposed system collects the data of a user who is trying to register their name for voting. The user is allowed to logging in when the

registration process is over. The following user section and admission section describes how the work is process is going to be carried out till voting and admin section describes the process involved in it.

User section:

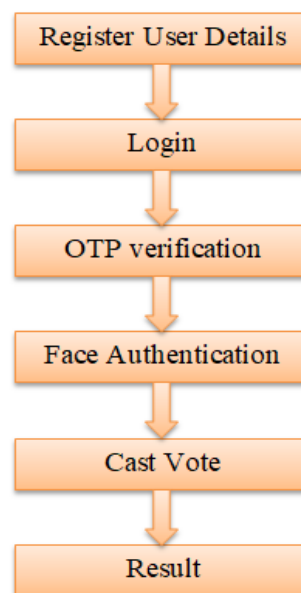


Figure 2 represents flow analysis of user section

Then process involved in user section is given in the format of flow chart which was visualized in figure 2. The registration for voting as per the age limit is the first and foremost step of this process. the In registration portal, the user needs to specify name with initial, permanent address as per Adhar card, E-mail id, and password, date of birth, Adhar card number, gender and temporary address. Once these details are entered the system verifies it and makes your

registration successful. Afterwards, it allows user to logging in. Once the data is collected, the collected information's are stored for further reference. If any images are uploaded by a user, the framework resized into acceptable form and performs gray scale conversion. After completing several steps the noise present in uploaded images are removed and stores that

information. The login portal asks user to put their registered mail id with password. Following login, the next step is verification. The user needs to verify registered mobile number by entering the OTP received during verification. If this check is completed, it will direct user to know details of upcoming election.

The information about party who is going to participate in their region is available in that section. After knowing information about it, the user can move on to voting. In this phase, face recognition is must. Once the facial image of a voter is captured, the system performs comparison of that image with preexisting data available in dataset and identification of

authorised person is done. For image recognition, the Machine learning (ML) algorithm such as LBP and CNN are used. The process is done by taking features extracted by LBP when the image undergoes feature extraction; by utilizing the extracted features, the CNN classifier

algorithm performs face recognition. For improving the understanding of classifier approach, these two algorithms are inter-combined.

LBP:

LBP is an operator utilized to define the texture features of images [17]. The feature extraction using LBP is shown in figure 3. The advantages of it are rotation and gray invariance. The feature extractor can get LBP coding at every pixel point and original LBP operator is extracted from images. Normally LBP patterns are not utilized as feature vector for classification; but LBP histogram features are used as feature vector for classification and recognition. The applications of LBP are texture classification, face recognition.

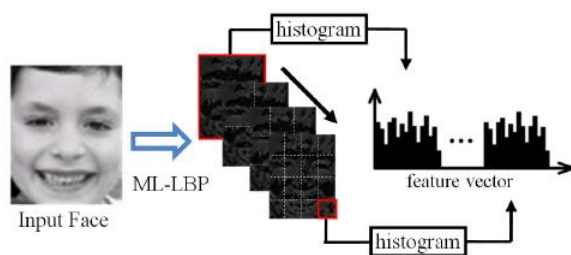


Figure 3 Histogram feature extraction using LBP

Normally LBP emerge as generic texture descriptor. The operator labelling every pixel of an image by thresholding a 3×3 neighborhood with the center pixel values and output is obtained in the form of binary numbers. The binary results are obtained by reading the values from clockwise, from top left neighbor. The pixel position is given in the format of (x, y), LBP is said to be aligned set of binary

comparison of pixel intensity of the central pixel and surrounding pixels [18]. The resultant decimal labelled value of the 8-bit word is written as:

$$LBP(x, y) = \sum_{i=0}^7 s(\ln(x, y) - lc(x, y))$$

Where lc represents grey value of center pixel (x,y) to grey value of 8 surrounding pixel, and function $s(k)$. The LBP functions with 8 neighbors of a pixel by utilizing center pixel as threshold.

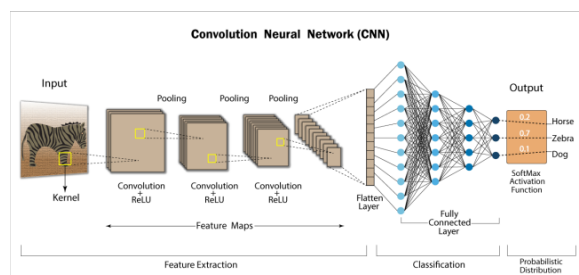


Figure 4 Classification of an image using CNN

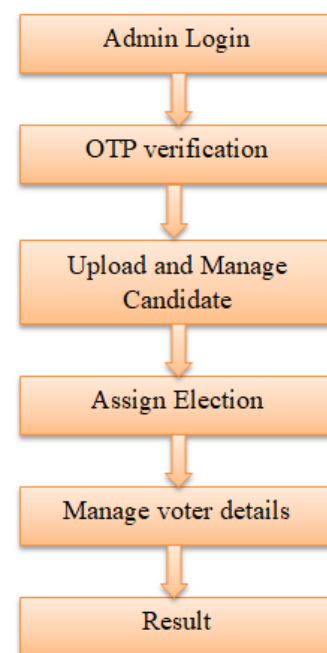
CNN is the more popular algorithm in deep learning and real time arithmetic circuits [19-23]. The recent advancement in CNN expands its growth of usage in various portions of ML techniques and giving better result than other neural networks. Normally CNN is utilized to simplify the complexity in selected data pre-treatment. The weight sharing network methodology looks like a biological neural

network and it minimizes the network model's

difficulty and decreasing the weight count. The

advantage of CNN is that the visibility of neural

network is more when intake is multidimensional and enabling it to network by eliminating the need of data reconstruction and complications in traditional classifier algorithms [20]. In many cases, CNN utilizes convoluted layer linked to the sampling layer and finally convolutional layer. The convolutional layer is employed to extract essential features and then the features are merged to get abstract features; at the end of this stage image object properties are available.



Admin section:

Figure 5 flow analysis of admin section

The work flow of admin is depicted in figure 9. The administrator is in charge of keeping an eye on the entire system. The login id and password for the first admin are standard.

ADMIN PORTAL

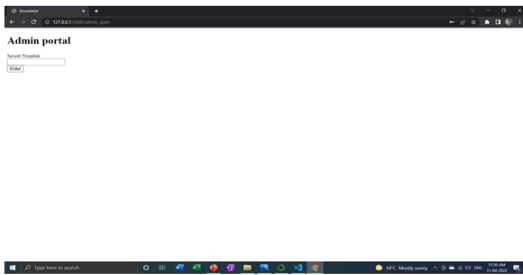


Figure 6 Admin portal

Admin can update the details of candidate who is going to participate in election as per booth. The user list must be in a csv file with user details such as part name, email, and area. Admin will compete with this information, and the file will be uploaded from data. The registered user can also be monitored by the

administrator. Elections on upcoming dates can also be assigned by the administrator.

ID	Name	Age	Gender	Address	E-Mail ID	Mobile Number	Area	Party
23	SPR	70	Male	100/Chennai	sp@gmail.com	8907780090	Tamil Nadu	ADMR
24	SPR	68	Male	Madurai	SP@gmail.com	7058495849	Madurai	ADMR
25	SPR	70	Male	100/Chennai	SP@gmail.com	8907780090	Tamil Nadu	ADMR
26	SPR	25	Male	Madurai	SP@gmail.com	7058495849	Madurai	ADMR

Figure 7 Entire details of parties participating in Election

IV. RESULT AND DISCUSSION

The details about election are known and the user who is going to vote is shown in webpage with details.

Voter ID	Name	Address	Mail	Password	DOB	Mobile Number	Aadhar Number	Area	Gender
512006626	Shamir	Chennai	shamir@gmail.com	1234	2000-07-08	9751479580	234567890123	Tamil Nadu	Female

Figure 8 User profile

ID	Name	Age	Gender	Party	Vote
23	SPR	70	Male	ADMR	0
24	SPR	68	Male	ADMR	0
25	SPR	70	Male	ADMR	0
26	SPR	25	Male	ADMR	0

After recognising face of voter, the web page allows entering voting and it is shown in figure 10.

Figure 9 Voting section

ID	Name	Age	Gender	Party	Vote
23	SPR	70	Male	ADMR	0
24	SPR	68	Male	ADMR	0
25	SPR	70	Male	ADMR	0
26	SPR	25	Male	ADMR	0

Once the voting is done, the webpage will instruct as like figure 10.

Figure 10 Completion of Voting

Area	ADMR	DMK	ANMK	BJP	INC	NTK	Winner
Tamil Nadu	0	1	0	0	0	0	DMK - 1
Madurai	0	0	0	0	0	0	ADMR - 0

The user can know the result of their favourite party leaders. It will show where the places elections are conducted and who won the post.

Figure 11 Election Result

V. CONCLUSION

The majority of India's cities are primarily responsible for Smart Voting. It should be seen as the most pressing concern for the vast majority of us. Existing voting techniques need a lot of manual labour and manpower, and converting voting to online require a secure voting system to cast voters' votes. The

technology of Machine Learning is used to recognise a person's face and determine whether or not a voter is authorised. In the future, we will include cloud storage system to prevent unauthorised users to change or do some modifications in dataset. The use of cloud storage system with SQL attack prevention in voting systems will help to provide a secure and cost-effective election while also protecting the privacy of voters.

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