



Smart Voting Web Based Application Using Face Recognition, Aadhar and OTP Verification

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ABSTRACT

There are currently two ways to vote in India. They are secret ballots and electronic vote machines, but these two processes have some limitations or disadvantages. The current system is also insecure. Many people miss the opportunity to vote simply because they need to go to the polling station and wait for several places to vote. In this paper, we proposed a voting method. In our method, the voting process has three security stages. The first stage is facial recognition, the second stage is Election ID (EID) number verification, and the third stage is One-Time-Password (OTP) verification using the user's mobile phone number registered.

Keywords: Smart Voting System, Facial Recognition, OTP, Voter ID, winning party, python, OpenCV.

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1. Introduction

The enhancement of science and technology leads to make the life more comfortable than older days. The emerging technologies like neutrosophic shortest path [1-5], wireless sensor network [6-13], transportation problem [14-16], computer language [17-18], uncertainty problem [19-24], fuzzy shortest path [25-28], powershell [29], neural network [30], routing [31], image processing [32] making the products more intelligent and self-healing based. The smart city applications like smart water [33-34], smart grid, smart parking, smart resource management, etc. are based on IoT and IoE [35-38] technologies.

In this manuscript, a smart voting web based application is proposed using face recognition. In India, we currently have two voting mechanisms [39] The first is the secret ballot paper, [40] the second is the Electronic Vote Machine (EVM), but the voting process has its shortcomings, which is why it is currently ongoing system is not so secure. In this proposed system, voters used three levels of verification. The first is the Aadhar number verification, and the second level is face recognition. The third is Voter ID verification.

The voting scheme has evolved from the previous manual counting to a system that includes paper, punch cards, optical scanners and mechanical levers, that is, an electronic voting system [41], This voting application is a time-consuming system. Therefore, due to the large population of India, they cannot vote, and the voting process for registered users is very cumbersome [42]. The secure online voting system solves this problem through online voting. In the "secure online voting system", voters can use their "voting rights" online without difficulty.

1.1. Existing System

The current system that exists now is a machine and paper-based voting system, which requires a lot of manpower and a lot of resources. This voting system also encounters difficulties in the counting process, which is also because it counts manually. As per the recent voting system, symbols of various political parties are used by ballot machines display. When we click the option with the political party symbol, the voting is done. People with voting rights may use fake voting cards to vote, which may cause problems. In the current system, the person has to walk a long way to the electoral district to vote. Maintaining discipline and security requires a lot of manpower, so it is crucial to complete the election within a day. The time and place of voting are predefined. on election day each polling booth would be open for at least 8 hours [43].

The *Figure 1* shows the voters who need to reach the polling booth. The first step is identity verification, which is verified by the staff on duty. Then, the official left an inedible ink mark on the left index finger of the voter. After that, the voter must sign on the register and enter the voting room. To mark a vote, voters must press the candidate button on the EVM machine on the name and symbol of their choice. When the button is clicked by voter, the indicator light will glow on the symbol with a beep, indicating that the vote has been successfully recorded. Every time this process needs to be repeated, the building and manpower of the voting place need to be adjusted [43].



Figure 1. Existing voting process scenario.

To overcome this problem, as we said before, smart voting system provides an effective way to develop the entire voting system. The smart voting application is a Web based application that allows users to vote in their smart phones.

1.2. Proposed System

In this application, we are using three different features

Aadhar Number Verification. During voter registration, the system will ask voters to provide an Aadhar card number. The entered Aadhar number has been verified from the database provided by the election committee.

Voter id Card Number and OTP. In this stage of verification, the entered id number is matched from the database and sent One Time Password to voter's mobile number.

Face Recognition of The User. In this step, face algorithm is used to verify the voter's image from the database. The application can be used in android phones, and voting can only be done on voting day, which will be handled by the administrator. If there are different voting stages, the app will only enable users on the voting day.

1.3. Objectives

The purpose of this work is to develop an interactive voting system in which users can use their pre-stored information in the database to participate when creating an Aadhar ID. In this system, people with Indian nationality, over 18 years of age and regardless of gender can vote through the online system without going to any physical polling station. Every time a user logs in to the system, the ID and image of the voter in the database are used to verify the user. Through this development, we can obtain a secure website that contains all voting methods in a single website.

2. Literature Survey

Table 1. Literature review.

S.no	Authors	Year	Description
1.	Rotondi and Iyer [44]	2000	The authors proposed a smart voting architecture designed to extend the chameleon functionalities to collect and validate data across multiple replicas of same application.
2.	Stradiotto et al. [45]	2010	The authors proposed the method called International Direct Digital Election (ID2E). They are using the Android Platform smart phones and made testing the international voting using SMS protocol.
3.	Patel et al. [46]	2013	The authors proposed the method in which voter verification will be done through face recognition.
4.	Nadaph et al. [47]	2015	The authors proposed the two-fold system one is voting through website and other is through mobile phones. They are using Self-descriptive GUI and IVR.
5.	Peter et al. [48]	2018	The authors proposed the machine to vote, there is no need of polling officer. Voter verification will be done by his/her fingerprint.

S.no	Authors	Year	Description
6.	Mahajan et al. [49]	2018	The authors proposed an android based application in which verification will be done by fingerprint and face recognition, and voting PIN.
7.	Kumar et al. [50]	2020	The Authors proposed a web based democratic framework utilizing Biometric discovery for face using Aadhar.
8.	Priyadarshini et al. [51]	2020	The Authors proposed a RFID based smart voting system through frontal face recognition technique.
9.	Madhuri et al. [52]	2017	The Authors proposed Aadhar's secure Intelligent voting system which is mobile application.
10.	Mandavkar and Agawane [53]	2015	The Authors Proposed an identity verification technology that uses facial detection and recognition.

3. Proposed Methodology

The paper discussed the use of Smart web-based online voting application that propose a mobile application that has high security compared with existing system. On the day of election, voters must log in with Aadhar number and Date of Birth to the system which will be compared with stored information of voter for verification. We also propose an identity verification technology that uses facial detection and recognition. Voting will be secret, and each vote will be counted automatically. This will achieve increased participation, reduce election costs, and improve the precision of the results. We propose one more technology that is verification of voter using OTP and Election Id Number. In this process, voter has to login with Aadhar number (as user id) and dob (as password). Voter would be active on that day itself once the credential matched with existing voter id to the database, later on OTP (One Time Password) will send to the voter's mobile number and voter has to enter the same OTP sent on their phone number. Once the OTP entered by the user then it means he/she will be able to give vote. After that Candidate's name will be displayed on screen based on their voter's constituency place and there will be a button provided for each candidate which is called as "Vote" button. Voter just has to press vote button to vote his/her favorite candidate. Once vote is done by the user, voter will automatically log out with their application. In this section we are going to discuss some algorithm and Pseudo code used in proposed model in *Table 2* and *Table 3*.

3.1. Proposed Local Binary Patterns Histogram (LBH) Method

Table 2. Proposed local binary patterns histogram (LBH) method.

Steps	Overview
Step I	We require camera to capture images for detecting faces using Haar feature-based cascade classifiers.
Step II	After that we train a model based on detecting faces using LBPH (Local Binary Patterns Histograms) Algorithm.
Step III	After that it predicts the face using LBPH algorithm with the help of trained mode.

3.2. Pseudo Code of Proposed System

Table 3. Pseudo code for smart voting web-based application.

Steps	Elaboration
Step I	First create a Virtual Environment and import Django, OpenCV, MySQL Client based on your python version.
Step II	Then create a Django project.
Step III	Design user interface using Html, CSS and Java script of smart online voting system.
Step IV	Design both admin and user side. In user side, make a page of login to which user can login with their respective Aadhar and DOB. And after that give options to verify user by face recognition or OTP verification.
Step V	In admin side, add all the respective feature to maintain the details of the user and results of vote which is done by user.
Step VI	Design Database Structure in model.py inside migrations.
Step VII	Create migrations and apply to the database.
Step VIII	Write all code of web-based application pages in views.py with appropriate functions.
Step IX	Run Django Server using terminal.
Step X	Add all user details to the application then they can vote.

3.3. Flowchart

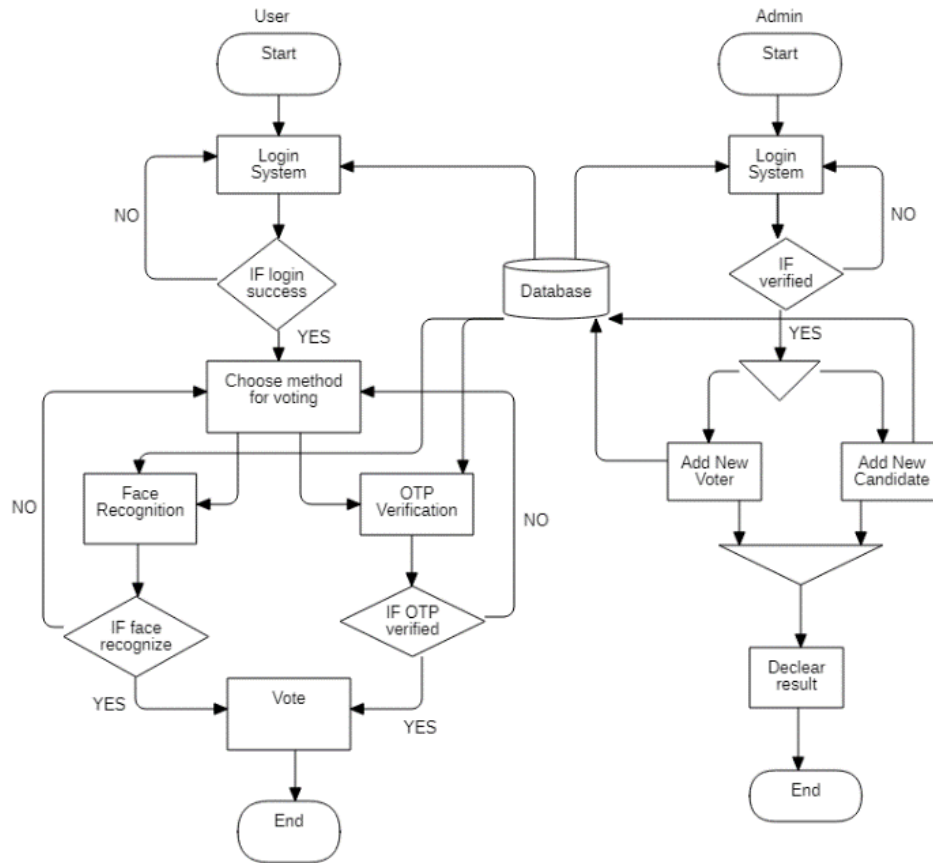


Figure 2. Flowchart of web-based application

- The first thing that you have to keep in mind that your Aadhar Registration should be done by this voting application in advance by this website, which is done by the administrator. User's entire information will be handled by administrator. So, if user's data is not registered in this website then you will not be able to login and vote in this application.
- So First of all, in this application user will be able to login with his/her Aadhar Number as user Id and DOB as your password.
- After login successfully, user will have 2 levels of verification to verify themselves, i.e.
 - Verify Yourself by Facial Recognition
 - Verify Yourself by OTP Verification.

You can choose any one option according to yourself, which is comforting for you.

- If you choose verify yourself by Facial Recognition, then after clicking on button, your device camera will open and capture user's image. If your face matches to the data in the database, then system will allow you to vote and redirect you in the vote section.

- And if you choose verify yourself by OTP Verification, then after clicking on button, you will have to enter your Election Id number and then on time password will be send to your mobile number and after verifying you will able to vote.
- So, after the verification process is done, user will get a page of all candidates for voting. You just have to click on the button in front of your favorite candidate. And after voting you will automatically log out from the site.
- After the voting day is over, the admin will automatically count votes and declare the result and winning candidates will be displayed on the home page. And User can login again and see the result.

4. Result and Discussion

This proposed system will be beneficial in many ways. The voter verification will be based on face recognition, Aadhar verification and also the voter Id. Only verified voters can vote. Voters can only vote once. Therefore, multiple voting or virtual voting is prohibited. This proposed system will limit the voting time period and only allow voters to vote during that time period. Since there will be no crowds, there is no chance of violence. As an automated system, there is no need to arrange elections in different locations. Voting results can be generated automatically and quickly. This proposed system is uninterrupted, consolidate, economical and time-centric. Now In this section we are going to give some snapshots of proposed system.



Figure 3. Home page.

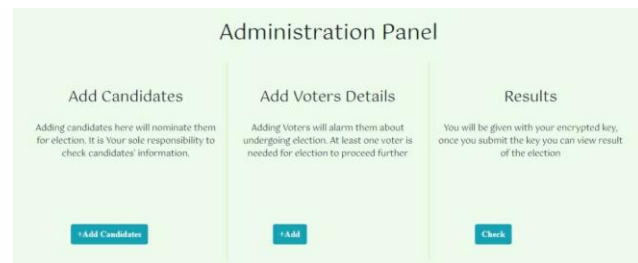


Figure 4. Admin panel.



Figure 5. Verify by facial recognition.



Figure 6. Verify manually.



Figure 7. Face verification.

Candidate Name	Party Logo	Candidate's Image	Gender	Constituency Place	Vote Count
Y.S. Jagan Mohan			male	Andhra Pradesh	2
Yanamala Ramakrishnu			male	Andhra Pradesh	1
T. Jeevan Reddy			male	Andhra Pradesh	0

Figure 8. Final result.

5. Conclusion

Smart voting System can help to accelerate the voter's count as people will find it trouble-free to vote. It can be used for those who do not have issued and registered for their voter ID card. It can help reduce workload and reduce manual operations. It can reduce human error when calculating the number of votes. It can help reduce the manpower required at polling stations and time consumed. In future we can add a fingerprint verification also i.e. to make the security strong.

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References

- [1] Broumi, S., Dey, A., Talea, M., Bakali, A., Smarandache, F., Nagarajan, D., ... & Kumar, R. (2019). Shortest path problem using Bellman algorithm under neutrosophic environment. *Complex & intelligent systems*, 5(4), 409-416.
- [2] Kumar, R., Dey, A., Broumi, S., & Smarandache, F. (2020). A study of neutrosophic shortest path problem. In *Neutrosophic graph theory and algorithms* (pp. 148-179). IGI Global.
- [3] Kumar, R., Dey, A., Broumi, S., & Smarandache, F. (2020). A study of neutrosophic shortest path problem. In *Neutrosophic graph theory and algorithms* (pp. 148-179). IGI Global.
- [4] Kumar, R., Edalatpanah, S. A., Jha, S., & Singh, R. (2019). *A novel approach to solve gaussian valued neutrosophic shortest path problems*. Infinite study.
- [5] Kumar, R., Edalatpanah, S. A., Jha, S., Broumi, S., & Dey, A. (2018). *Neutrosophic shortest path problem*. Infinite Study.
- [6] Mohapatra, H., Rath, S., Panda, S., & Kumar, R. (2020). Handling of man-in-the-middle attack in wsn through intrusion detection system. *International Journal*, 8(5), 1503-1510.
- [7] Mohapatra, H., Debnath, S., & Rath, A. K. (2019). Energy management in wireless sensor network through EB-LEACH. *International journal of research and analytical reviews (IJRAR)*, 56-61.

- [8] Mohapatra, H., Rath, A. K., Landge, P. B., & Bhise, D. (2020). A comparative analysis of clustering protocols of wireless sensor network. *International journal of mechanical and production engineering research and development (IJMPERD) ISSN (P)*, 2249-6890.
- [9] Mohapatra, H., & Rath, A. K. (2020). Survey on fault tolerance-based clustering evolution in WSN. *IET Networks*.
- [10] Mohapatra, H., Debnath, S., Rath, A. K., Landge, P. B., Gayen, S., & Kumar, R. (2020). An efficient energy saving scheme through sorting technique for wireless sensor network. *International journal*, 8(8).
- [11] Mohapatra, H., & Rath, A. K. (2019). Fault-tolerant mechanism for wireless sensor network. *IET wireless sensor systems*, 10(1), 23-30.
- [12] Mohapatra, H., & Rath, A. K. (2019). Fault tolerance through energy balanced cluster formation (EBCF) in WSN. In *Smart innovations in communication and computational sciences* (pp. 313-321). Springer, Singapore.
- [13] Mohapatra, H.; Rath, A. K. Fault tolerance in WSN through PE-LEACH protocol. *IET Wireless Sensor Systems 2019*, 9 (6), 358-365(7).
- [14] Pratihari, J., Kumar, R., Dey, A., & Broumi, S. (2020). Transportation problem in neutrosophic environment. In *Neutrosophic graph theory and algorithms* (pp. 180-212). IGI Global.
- [15] Kumar, R., Edalatpanah, S. A., Jha, S., & Singh, R. (2019). A Pythagorean fuzzy approach to the transportation problem. *Complex & intelligent systems*, 5(2), 255-263.
- [16] Pratihari, J., Kumar, R., Edalatpanah, S. A., & Dey, A. (2020). Modified Vogel's approximation method for transportation problem under uncertain environment. *Complex & intelligent systems*, 1-12.
- [17] Mohapatra, H. C. (2018). *Programming: Practice*. Amazon.
- [18] Mohapatra, H., & Rath, A. K. (2020). *Fundamentals of software engineering*. BPB.
- [19] Gayen, S., Jha, S., Singh, M., & Kumar, R. (2019). On a generalized notion of anti-fuzzy subgroup and some characterizations. *International journal of engineering and advanced technology*, 8, 385-390.
- [20] Gayen, S., Smarandache, F., Jha, S., & Kumar, R. (2020). Interval-valued neutrosophic subgroup based on interval-valued triple t-norm. In *Neutrosophic sets in decision analysis and operations research* (pp. 215-243). IGI Global.
- [21] Gayen, S., Smarandache, F., Jha, S., Singh, M. K., Broumi, S., & Kumar, R. (2020). Introduction to plithogenic hypersoft subgroup. *Neutrosophic sets and systems*, 33(1), 14.
- [22] Gayen, S., Smarandache, F., Jha, S., Singh, M. K., Broumi, S., & Kumar, R. (2020). Soft subring theory under interval-valued neutrosophic environment. *Neutrosophic sets and systems*, 36(1), 16.
- [23] Gayen, S., Smarandache, F., Jha, S., Singh, M. K., Broumi, S., & Kumar, R. (2020). Introduction to plithogenic subgroup. In *Neutrosophic graph theory and algorithms* (pp. 213-259). IGI Global.
- [24] Gayen, S., Smarandache, F., Jha, S., & Kumar, R. (2020). Introduction to interval-valued neutrosophic subring. *Neutrosophic sets and systems*, 36(1), 17.
- [25] Kumar, R., Jha, S., & Singh, R. (2020). A different approach for solving the shortest path problem under mixed fuzzy environment. *International journal of fuzzy system applications (IJFSA)*, 9(2), 132-161.
- [26] Kumar, R., Jha, S., & Singh, R. (2017). Shortest path problem in network with type-2 triangular fuzzy arc length. *Journal of applied research on industrial engineering*, 4(1), 1-7.
- [27] Kumar, R., Edalatpanah, S. A., Jha, S., Gayen, S., & Singh, R. (2019). Shortest path problems using fuzzy weighted arc length. *International journal of innovative technology and exploring engineering*, 8(6), 724-731.
- [28] Kumar, R., Edalatpanah, S. A., & Mohapatra, H. (2020). Note on "Optimal path selection approach for fuzzy reliable shortest path problem". *Journal of intelligent & fuzzy systems*, (Preprint), 1-4.
- [29] Mohapatra, H., Panda, S., Rath, A., Edalatpanah, S., & Kumar, R. (2020). A tutorial on powershell pipeline and its loopholes. *International journal of emerging trends in engineering research*, 8(4), 975-982.

- [30] Mohapatra, H. (2009). *HCR by using neural network* (Master's thesis, Govt. College of Engineering and Technology, Bhubaneswar).
- [31] Panda, M., Pradhan, P., Mohapatra, H., & Barpanda, N. K. (2019). Fault tolerant routing in heterogeneous environment. *International journal of scientific & technology research*, 8, 1009-1013.
- [32] Nirgude, V. N., Nirgude, V. N., Mahapatra, H., & Shivarkar, S. A. (2017). Face recognition system using principal component analysis & linear discriminant analysis method simultaneously with 3d morphable model and neural network BPNN method. *Global journal of advanced engineering technologies and sciences*, 4, 1-6.
- [33] Mohapatra, H., & Rath, A. K. (2020, October). Nub less sensor based smart water tap for preventing water loss at public stand posts. In *2020 IEEE Microwave Theory and Techniques in Wireless Communications (MTTW)* (Vol. 1, pp. 145-150). IEEE.
- [34] Mohapatra, H., & Rath, A. K. (2020). IoT-based smart water. *IOT technologies in smart-cities: from sensors to big data, security and trust*, 63.
- [35] Mohapatra, H. (2020). Offline drone instrumentalized ambulance for emergency situations. *International journal of robotics and automation (IJRA)*, 9(4), 251-255.
- [36] Mohapatra, H., & Rath, A. K. (2019). Detection and avoidance of water loss through municipality taps in India by using smart taps and ICT. *IET wireless sensor systems*, 9(6), 447-457.
- [37] Panda, H., Mohapatra, H., & Rath, A. K. (2020). WSN-Based Water Channelization: An Approach of Smart Water. In *Smart Cities—Opportunities and Challenges* (pp. 157-166). Springer, Singapore.
- [38] Rout, S. S., Mohapatra, H., Nayak, R. K., Tripathy, R., Bhise, D., Patil, S. P., & Rath, A. K. (2020). Smart Water Solution for Monitoring of Water Usage Based on Weather Condition. *International journal*, 8(9).
- [39] Pandit, V., Majgaonkar, P., Meher, P., Sapaliga, S., & Bojewar, S. (2017, May). Intelligent security lock. *2017 international conference on trends in electronics and informatics (ICEI)* (pp. 713-716). IEEE.
- [40] Chauhan, C. U., Kalnawat, A., Aswale, A., Gautam, U., & Nemad, R. (2017). Survey Paper on a Novel Approach: Web Based Technique for Vote Casting. *International journal of engineering and management research (IJEMR)*, 7(5), 71-75.
- [41] Mohammed, D. A. A., & Timour, R. A. (2013). Efficient e-voting android based system. *International journal of advanced research in computer science and software engineering*, 3(11).
- [42] Amritkar, M. V., Dudhe, R., Sawant, K., Phutane, S., & Dadhich, P. (2016). Secure online voting system. *International journal of advanced research (IJAR)*, 4 (11), 1648-1653. DOI: 10.21474/IJAR01/2257
- [43] Sahu, H., & Choudhary, A. (2011). Polling System Using GSM Facility. *International journal of scientific & engineering research*, 2(10), 1.
- [44] Rotondi, G., & Iyer, R. K. (2000). A Smart Voting Subsystem for Distributed Fault Tolerance. *Coordinated Science Laboratory Report no. UILU-ENG-00-2216, CRHC-00-05*.
- [45] Stradiotto, C. R., Zotti, A. I., Bueno, C. O., Bedin, S. P., Hoeschl, H. C., Bueno, T. C., ... & Mirapalheta, V. O. (2010, December). Web 2.0 e-Voting system using android platform. *2010 IEEE international conference on progress in informatics and computing* (Vol. 2, pp. 1138-1142). IEEE.
- [46] Patel, T., Chokshi, M., & Shah, N. (2013). Smart device based election voting system endorsed through face recognition. *International Journal of advance research in computer science and software engineering*, 3(11).
- [47] Nadaph, A., Bondre, R., Katiyar, A., Goswami, D., & Naidu, T. (2015). An implementation of secure online voting system. *International journal of engineering research and general science*, 3(2), 1110-1118.
- [48] Peter, M. M. V., Priya, M. V., Petchammal, M. H., & Muthukumaran, D. N. (2018). Finger Print Based Smart Voting System'. *Asian journal of applied science and technology*, 2(2), 357-361.
- [49] Mahajan, M., Pawar, Y., Wagh, M., Alai, S., & Biswas, P. (2018). M-Vote (Online Voting System). *International research journal of engineering and technology (IRJET)*, 5 (5), 4099-4102.

- [50] Kumar, G., Kaushik, R., Kumar, K., & Birla, V. (2020). Design and development to face recognition system by synthesizing AADHAR enabled platform for online voting. *International journal of innovative research in computer science & technology (IJIRCST)*, 8 (3), 242-246.
- [51] Priyadarshini, M. R., Shangamithra, M. D., Swathi, M. T., Subhaharini, M. G., & Sreenivasan, M. L. (2020). Design and realization of RFID based smart voting system with frontal face recognition technique. *International journal of innovative research in technology*, 6 (12), 338-343.
- [52] Madhuri, B., Adarsha, M. G., Pradhyumna, K. R., & Prajwal, B. M. (2017, December). Secured Smart Voting System using Aadhar. *2017 2nd international conference on emerging computation and information technologies (ICECIT)* (pp. 1-3). IEEE.
- [53] Mandavkar, A. A., & Agawane, R. V. (2015, June). Mobile based facial recognition using OTP verification for voting system. *2015 IEEE international advance computing conference (IACC)* (pp. 644-649). IEEE.



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