

Aavishkar :

University of Mumbai

Inter-collegiate Research Convention, Academic Year 2023-2024

**Mitigating Electoral Fraud: A Multi-Layered Authentication System with Immutable
Vote Logging**

References:

1. Election Commission of India, "65.79% voter turnout recorded at polling stations in GE 2024," Press Note No. ECI/PN/116/2024, Jun. 6, 2024.
2. I. Forrest and P. Shikarpur, "A Tamperproof Logging Implementation," *Pangea Blog*, Jun. 15, 2022.
3. CUNY IT Help, "Accessible Multi-Factor Authentication (MFA) Options at CUNY," City University of New York, n.d.
4. K. Gupta, P. Singh, and R. K. Singh, "Blockchain Voting in the Indian Context: Potentials, Challenges, and Analysis of Current Electoral Issues," *TIJER - International Journal for Engineering Research*, vol. [Year inferred from content], pp. [Page numbers].
5. "Challenge to the ECI's Revision of Electoral Rolls in Bihar," *Supreme Court Observer*, Sep. 1, 2025.
6. S. Arora, "Challenges and Solutions in Developing Election Fraud Detection Systems in India: A Review," *International Journal for Multidisciplinary Research (IJFMR)*, vol. 6, no. 3, May 2024. [Online]. Available: <https://www.ijfmr.com/papers/2024/5/28768.pdf>.
7. "Digital Impersonation Risks and Prevention: A Security Guide," *Startup Defense LLC*, Nov. 23, 2025.
8. U.S. Election Assistance Commission, "Disability, the Voting Process, and the Digital Divide," *U.S. EAC*, Jul. 26, 2022.
9. "EC issues 3 lakh notices over Voter ID discrepancies in Bihar; foreign nationals among those flagged," *The New Indian Express*, Aug. 29, 2025.

10. Election Commission of India, "ECI ready to pilot remote voting for domestic migrants; migrant voter need not travel back to home state to vote," Press Note No. ECI/PN/100/2022, Dec. 29, 2022.
11. R. Mittal and P. Malik, "EVMs: Technical safeguards and administrative protocols for security and integrity of electoral process," *ETGovernment*, May 23, 2024.
12. Principal Scientific Adviser to the Government of India, "Election Commission of India working with IIT Madras and CDAC for a more efficient voting system," n.d.
13. Center for Internet Security, "Election Security Spotlight – Multi-Factor Authentication," *CIS*, Jun. 2025.
14. S. Ghosh, "Electoral Databases – Privacy and Security Concerns," *Centre for Internet and Society*, Jan. 16, 2014.
15. "Electronic voting in India," *Wikipedia*, n.d. [Online].
16. A. Kjelsrud and A. Kotsadam, "Female employment and voter turnout - Evidence from India," *Indian Statistical Institute*, Sep. 2022.
17. P. Goldstein, "How Multi-factor Authentication Enhances Election Security," *StateTech Magazine*, Apr. 20, 2020.
18. Forbes Technology Council, "How To Defend Against Web Impersonation (For Businesses And Consumers)," *Forbes*, May 7, 2025.
19. Dennis, "How important is it to store your SIEM logs in a tamper-proof database?," *immudb*, Jan. 4, 2023.
20. A. Chowdhury, "How the BJP Wins Over Women," *Carnegie Endowment for International Peace*, Apr. 26, 2024.
21. "India's Best and Government Approved Online Election Technology," *Right2Vote*, 2025.
22. H. K. Prasad, J. A. Halderman, and R. Gonggrijp, "India's EVMs are Vulnerable to Fraud," n.d. [Online].
23. A. D. Majumdar, "Indian women can swing polls but not their political careers? Study shows why," *Association for Democratic Reforms*, Feb. 5, 2025.
24. S. Kalia, "New Voting Reforms May Allow Linking of Aadhaar With Voter ID, Raising Privacy Concerns," *The Swaddle*, Dec. 16, 2021.

25. "One Hundred and Sixth Amendment of the Constitution of India," *Wikipedia*, n.d. [Online].
26. M. Parks, "Online voting is insecure but many Americans still vote that way," *NPR*, Sep. 7, 2023.
27. S. A. Prillaman, "Strength in Numbers: How Women's Groups Close India's Political Gender Gap," Oct. 5, 2017.
28. Paytm Editorial Team, "The Future of Voting: How Biometric and Digital IDs Are Transforming Elections," *Paytm Blog*, Sep. 9, 2025.
29. M. Fry and G. A. Macht, "The Impact of Accessible Voting Technology on the 2024 Presidential Election," *Crossroads*, Jun. 2025.
30. T. Bussa, "The Role of Cyber Threat Intelligence in Election Security," *ThreatConnect*, Apr. 4, 2024.
31. A. K. Jha, "The paradox of women voters," *India Today*, Feb. 25, 2019.
32. P. Agrawal, S. Sharma, and S. Banerjee, "Unsuitability of internet voting, and blockchain vs public bulletin board for integrity of elections and electoral rolls," *CSE, IIT Delhi*, Oct. 25, 2021.
33. J. Berwanger, "What Are Immutable Logs? A Complete Guide," *HubiFi*, Nov. 27, 2025.
34. "What Is Election Security? How To Protect Election Infrastructure," *Fortinet*, n.d.
35. R. Kumar, "What Lies Behind India's Rising Female Voter Turnout," *Carnegie Endowment for International Peace*, Apr. 5, 2024.
36. M. Kapoor and S. Ravi, "Women Voters in Indian Democracy: A Silent Revolution," *Economic and Political Weekly*, vol. 49, no. 17, Apr. 2014.
37. P. S. Khileri, "Women voters as the new electoral kingmakers: Examining the gender turnout gap and pro-incumbency trends in India's 2025 elections," *International Journal of Multidisciplinary Education and Research*, vol. 10, no. 4, pp. 35-39, 2025.
38. K. Rani, A. H. Ganaie, and R. Manzoor, "Awareness, Participation and Political Empowerment of Women in Panchayat Raj Institutions: A Study of Kapurthala District, Punjab," *Lex localis - Journal of Local Self-Government*, vol. 23, no. S5, pp. 2628-2642, 2025.

39. L. Schur et al., "Ensuring Voting Access Across the Electorate," *MIT Election Data and Science Lab*, 2024. [Online]. Available: <https://electionlab.mit.edu/sites/default/files/2024-04/voting-access-usability.pdf>.
40. D. Castro and W. Quesenbery, "Innovations for Accessible Elections," *Information Technology and Innovation Foundation*, 2011. [Online]. Available: https://www.eac.gov/sites/default/files/event_document/files/Innovations_for_Accessible_Elections.pdf.
41. A. Beliraya, A. Devadiga, P. Shetty, R. Poojary, A. Ashoka, and H. C. J, "Multifactor Authentication based Electronic Voting Machine," *International Journal of Engineering Research & Technology (IJERT)*, vol. 7, no. 08, 2019. [Online]. Available: <https://www.ijert.org/research/Multifactor-Authentication-based-Electronic-Voting-Machine-IJERTCONV7IS08069.pdf>.
42. "NIST Election Security Series: Implementing Multi-Factor Authentication," *National Institute of Standards and Technology*, Jan. 2023. [Online]. Available: <https://www.nist.gov/system/files/documents/2023/01/06/MFA-ElectionSecurityGuide-Factsheet.pdf>.
43. R. T. Snodgrass, S. S. Yao, and C. Collberg, "Tamper Detection in Audit Logs," in *Proceedings of the 30th VLDB Conference*, Toronto, Canada, 2004, pp. 504-515.