

Project Report: Blockchain-Based Voting System

GROUP MEMBERS:

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1. Project Overview

This project implements a **secure, decentralized voting system** using **Ethereum smart contracts**. The goal is to ensure transparency, immutability, and tamper-proof results in a digital election environment.

2. Technologies Used

- **Solidity**: For writing smart contracts (`Voting.sol`)
- **Hardhat**: Development environment for Ethereum
- **Node.js & Ethers.js**: Backend interaction with the blockchain
- **React.js (assumed)**: Frontend (based on standard practice, though frontend files not yet inspected)
- **MetaMask**: For blockchain wallet interaction

3. Smart Contract Functionality

The smart contract includes:

- Voter registration
- Candidate registration
- Casting votes
- Preventing double voting
- Vote tallying with immutable records

4. Deployment & Testing

The project uses **Hardhat** for:

- Compiling contracts
- Deploying to local/test networks
- Running unit tests to validate contract behavior

5. Key Files

- `Voting.sol`: Core smart contract for election logic
- `hardhat.config.js`: Configuration for the Hardhat environment
- `scripts/deploy.js`: Script to deploy the contract
- `test/`: Directory for testing the smart contract

6. Benefits

- Enhances trust in digital elections
- Reduces human error and fraud
- Provides verifiable and transparent results

7. Limitations & Future Work

- Currently assumes honest nodes and network availability
- Future work includes frontend UI integration, voter authentication mechanisms, and deployment to Ethereum testnet/mainnet

8. Work Division

HADI:

- Developed the smart contract (`Voting.sol`)
- Wrote and configured deployment scripts
- Conducted testing using Hardhat

SAHIL:

- Set up the development environment (Node.js, Hardhat)
- Handled blockchain interactions with Ethers.js
- Prepared documentation and finalized project report

7. Conclusion

This project provides a fundamental implementation of a blockchain-based voting system. Future enhancements can include frontend integration, secure voter authentication, and deployment to public testnets.