GREENLAND:A SECURE LAND REISTRATION SCHEME FOR BLOCK CHAIN AND AI-ENABLED AGRICULTURE INDUSTRY

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ABSTRACT

Land registration systems are critical for maintaining ownership records, but traditional centralized systems are vulnerable to tampering and unauthorized modifications. This project proposes a secure and decentralized land registration system using blockchain and artificial intelligence (AI) technologies. Blockchain ensures tamper-proof, transparent, and decentralized storage of land records, while AI techniques are used to detect fraudulent transactions. In the proposed system, land transaction data is stored in the InterPlanetary File System (IPFS), and the corresponding hash is recorded on the blockchain using smart contracts developed in Solidity. Machine learning algorithms such as Logistic Regression, Support Vector Machine (SVM), Random Forest, XGBoost, and LightGBM are used to detect fraudulent transactions based on historical data. Among these, LightGBM achieves the highest accuracy. The system is implemented using Ethereum blockchain, IPFS, and Python-based machine learning models. Experimental results demonstrate improved security, transparency, and fraud detection capability. This approach provides a reliable and scalable solution for secure land registration in Agriculture Industry 5.0.

Keywords :Blockchain, Land Registration, IPFS, Smart Contracts, Fraud Detection, Machine Learning, LightGBM, Agriculture 5.0

I.INTRODUCTION

Land registration is a fundamental component of property management and agricultural development. Traditional land registration systems rely on centralized databases, which are prone to data manipulation, unauthorized access, and corruption. These vulnerabilities can lead to disputes, fraud, and loss of ownership records. Therefore, there is a need for a secure and transparent system that ensures data integrity and trust.

Blockchain technology offers a decentralized and immutable platform for storing data securely. By recording land transactions on a blockchain, it becomes nearly impossible to alter or tamper with ownership records. Additionally, the use of smart contracts automates the process of storing and retrieving

data, ensuring transparency and eliminating the need for intermediaries. IPFS is used for storing large transaction data, while only the hash is stored on the blockchain to ensure efficiency.

In addition to secure storage, fraud detection is a critical aspect of land registration systems. Machine learning algorithms can analyze transaction patterns and identify suspicious activities. In this project, various algorithms such as Logistic Regression, SVM, Random Forest, XGBoost, and LightGBM are used for fraud detection. The integration of blockchain and AI provides a comprehensive solution for secure, transparent, and intelligent land registration, supporting the vision of Agriculture Industry 5.0.

II SURVEY OF RESEARCH

[1] The study by Satoshi Nakamoto (2008) introduced blockchain as a decentralized and immutable ledger system. The methodology uses cryptographic hashing and distributed consensus to ensure data integrity and transparency. Results showed that blockchain eliminates reliance on centralized authorities and prevents data tampering. However, scalability and latency issues remain challenges. This research forms the foundation for secure land registration systems. In the proposed work, blockchain is used to store land ownership records securely and prevent unauthorized modifications.

[2] The research by Juan Benet (2014) introduced the InterPlanetary File System (IPFS), a distributed file storage system. The methodology uses content-based addressing to store and retrieve files efficiently. Results demonstrated improved data availability and reduced dependency on centralized servers. However, managing large-scale networks can be complex. In the proposed system, IPFS is used to store land transaction data, while only hash values are stored on the blockchain to ensure efficiency and security.

[3] The study by Gavin Wood (2014) introduced smart contracts for automating processes on blockchain platforms. The methodology involves writing programmable contracts that execute automatically when predefined conditions are met. Results showed improved efficiency and transparency in decentralized applications. However, smart contract vulnerabilities can pose security risks. In the proposed system, smart contracts are used to manage buyer and seller transactions securely.

[4] The research by Jerome Friedman (2001) introduced boosting algorithms that improve prediction accuracy by combining multiple weak learners. The methodology focuses on minimizing prediction errors iteratively. Results demonstrated high accuracy in classification tasks. However, boosting models require careful parameter tuning. This research

supports the use of advanced algorithms like XGBoost and LightGBM in fraud detection.

[5] The study by Tianqi Chen and Carlos Guestrin (2016) introduced XGBoost, an optimized gradient boosting algorithm. The methodology includes regularization and parallel processing for improved performance. Results showed that XGBoost achieves high accuracy in predictive tasks. However, it may require computational resources. In the proposed system, XGBoost is used for fraud detection and achieves high performance.

[6] The research by Guolin Ke et al. (2017) introduced LightGBM, a fast and efficient gradient boosting framework. The methodology uses histogram-based learning and leaf-wise tree growth for faster training and higher accuracy. Results demonstrated superior performance compared to other boosting algorithms. However, it may overfit if not properly tuned. In the proposed system, LightGBM achieves the highest accuracy in fraud detection, making it the best-performing model.

III. WORKING METHODOLOGY

The proposed Greenland system integrates blockchain, IPFS, and machine learning to provide a secure and intelligent land registration platform. Initially, users such as buyers and sellers register in the system using a web interface. Each user is authenticated and assigned a unique identity stored on the blockchain. When a buyer initiates a land transaction request, the raw transaction data—including sender details, receiver details, and transaction type—is uploaded to the system. This data is stored in the InterPlanetary File System (IPFS), which generates a unique hash value. This hash is then recorded on the blockchain using smart contracts developed in Solidity, ensuring tamper-proof and decentralized storage.

In the next phase, machine learning models are trained to detect fraudulent transactions. The dataset, such as the Ethereum fraud detection dataset, is preprocessed by converting non-numeric data into numeric format using label encoding and handling missing values. Feature selection techniques like ANOVA are applied to identify the most relevant features. The dataset is then split into training and testing sets, typically in an 80:20 ratio. Various machine learning algorithms, including Logistic Regression, Support Vector Machine (SVM), Random Forest, XGBoost, and LightGBM, are trained and evaluated using performance metrics such as accuracy, precision, recall, F1-score, and ROC curves. Among these, LightGBM achieves the highest accuracy and is selected as the final model.

Finally, the system integrates blockchain and machine learning for real-time transaction processing. When a buyer submits a land

request, the machine learning model analyzes the transaction data and predicts whether it is fraudulent or legitimate. The prediction result is displayed to the seller along with transaction details and IPFS hash. Based on this information, the seller can accept or reject the request. All transactions, including decisions, are recorded on the blockchain, ensuring transparency and auditability. The system is implemented using Ethereum blockchain, IPFS, Python for machine learning, and web technologies for user interaction, providing a secure, scalable, and intelligent land registration solution.

IV RESULTS EXPLANATIONS

In propose work author employing AI and Blockchain technologies in Land Registration as existing techniques were using centralized servers whose database can be easily tamper by server database administrator without getting detected. Blockchain has inbuilt support for decentralized storage, secured encrypted data storage and tamper proof data storage. In Blockchain based land registration ownership of registration will not be tamper any manner.

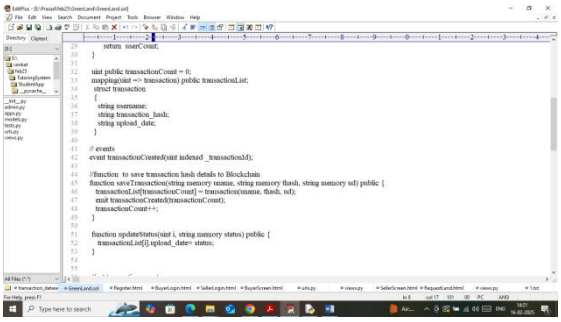
AI algorithms employed to detect fraud transaction from Blockchain Raw data which contains land details such as Sender information, receiver information, transaction type and many other raw data. AI algorithms will get trained on raw data and then trained model can be applied to detect frauds from future Blockchain raw data.

For accurate detection author has experimented with various ML algorithms such as Logistic Regression, Random Forest, SVM, XGBOOST and LIGHTGBM. Each algorithm performance was tuned using various hyper parameters and then evaluation done using various metrics such as Accuracy, Precision, Recall, FSCORE and ROC graph. Among all algorithms LIGHTGBM giving highest accuracy.

To train above algorithms author has used Ethereum dataset which can be download from below URL

https://www.kaggle.com/datasets/vagifa/ethereum-frauddetection-dataset/data

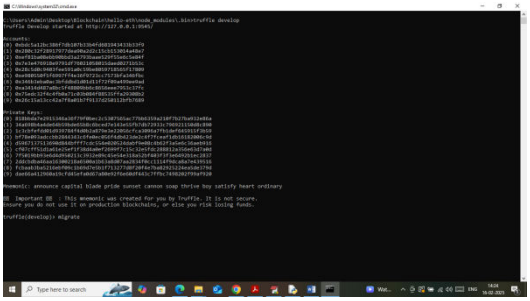
Land Transaction Raw data will get saved in IPFS (interplanetary file system) server whose storage hashcode will get saved in Blockchain for future retrieval. Blockchain can store or retrieve data using Smart Contracts which can be designed using Solidity Programming. This contract contains functions which can be called using any programming language to store and retrieve data. To manage Land transaction data we have designed following contract



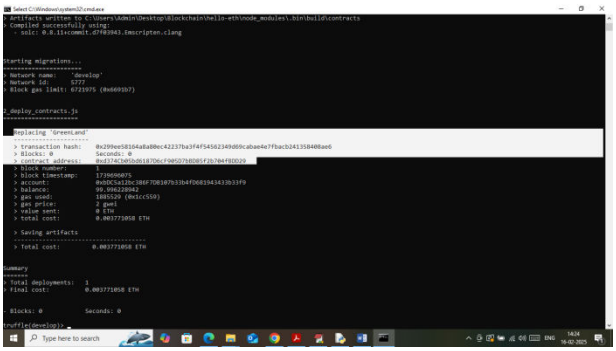
In above smart contract screen we have designed function to manage buyer, seller and

IPFS storage hashcode details. Now we need to deployed above contract in Blockchain Ethereum using below steps

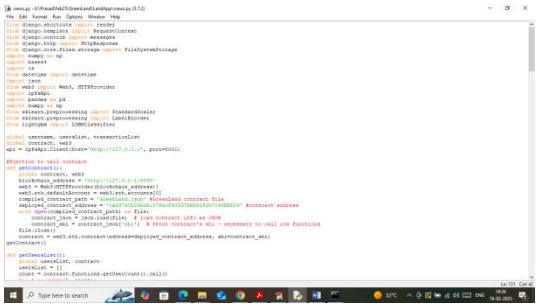
First go inside 'hello-eth/node-modules/bin' folder and then look and double click on 'runBlockchain.bat' file to get below screen



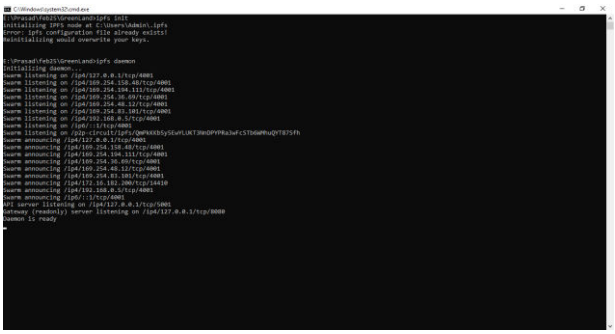
In above screen Ethereum started with default accounts and private keys and now type command as 'migrate' and then press enter key to get below page



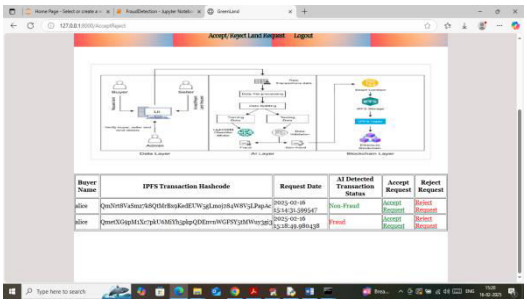
In above screen in white colour text can see 'Greenland' contract deployed and running successfully and let it run till you execute code. Now copy above contract address showing white text and then paste in python code to call above contract. In below screen showing python code calling above contract using address



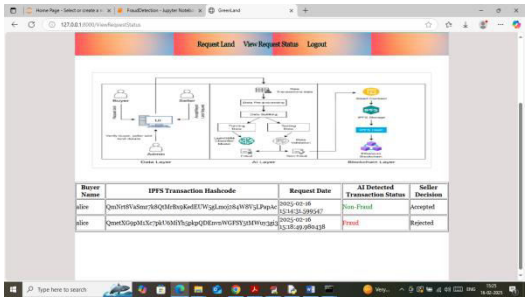
In above screen read red colour comments to know about contract calling using address. In above screen Blockchain running successfully and now double click on 'Start_IPFS.bat' file to start IPFS server and get below page



In above screen IPFS server started and let it run till you execute code.



In above screen seller can view list of land request with details like buyer name, IPFS storage hashcode of raw transaction and then can ML predicted status and then Seller can click on either accept or reject link to get below page



In above screen buyer can view all transaction raw data hashcode and then can ML predicted output along with seller decision as "Accepted or Rejected'.

V. CONCLUSION

The proposed Greenland system presents a secure and intelligent solution for land registration by integrating blockchain, IPFS, and machine learning technologies. By utilizing blockchain, the system ensures decentralized, tamper-proof, and transparent storage of land ownership records, eliminating the risks associated with centralized databases. The use of IPFS enables efficient storage of large transaction data, while only hash values are stored on the blockchain to maintain performance and scalability. Additionally, the integration of machine learning algorithms enhances the system by detecting fraudulent transactions in real time. Among the evaluated models, LightGBM achieved the highest accuracy, making it the most suitable for fraud detection. The web-based interface further improves usability by allowing buyers and sellers to interact seamlessly. Overall, the system provides a reliable, scalable, and secure framework for land registration, supporting the vision of Agriculture Industry 5.0 and reducing fraud and disputes in property transactions.

RE.FERENCES

[1] S. Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System," 2008.

[2] J. Benet, "IPFS – Content Addressed, Versioned, P2P File System," 2014.

[3] G. Wood, "Ethereum: A Secure Decentralised Generalised Transaction Ledger," 2014.

[4] T. Chen and C. Guestrin, "XGBoost: A Scalable Tree Boosting System," *Proc. ACM SIGKDD*, 2016.

[5] G. Ke et al., "LightGBM: A Highly Efficient Gradient Boosting Decision Tree," *Advances in Neural Information Processing Systems*, 2017.

[6] J. H. Friedman, "Greedy Function Approximation: A Gradient Boosting Machine," *Annals of Statistics*, 2001.

[7] L. Breiman, "Random Forests," *Machine Learning*, vol. 45, no. 1, pp. 5–32, 2001.

[8] C. Cortes and V. Vapnik, "Support Vector Machines," *Machine Learning*, 1995.

[9] D. W. Hosmer and S. Lemeshow, *Applied Logistic Regression*. Wiley, 2000.

[10] I. Goodfellow, Y. Bengio, and A. Courville, *Deep Learning*. MIT Press, 2016.

[11] C. M. Bishop, *Pattern Recognition and Machine Learning*. Springer, 2006.

[12] K. P. Murphy, *Machine Learning: A Probabilistic Perspective*. MIT Press, 2012.

[13] F. Chollet, *Deep Learning with Python*. Manning Publications, 2017.

[14] J. Brownlee, *Machine Learning Mastery with Python*. 2016.

[15] M. Swan, *Blockchain: Blueprint for a New Economy*. O'Reilly Media, 2015.

[16] A. Antonopoulos, *Mastering Bitcoin*. O'Reilly Media, 2014.

[17] N. Szabo, "Smart Contracts: Building Blocks for Digital Markets," 1996.

[18] D. Boneh and M. Franklin, "Identity-Based Encryption," *SIAM Journal on Computing*, 2003.

[19] R. Rivest, A. Shamir, and L. Adleman, "RSA Algorithm," *Communications of the ACM*, 1978.

[20] W. Diffie and M. Hellman, "New Directions in Cryptography," *IEEE Transactions on Information Theory*, 1976.

[21] K. Christidis and M. Devetsikiotis, "Blockchains and Smart Contracts for IoT," *IEEE Access*, 2016.

[22] Q. Yang et al., "Federated Machine Learning: Concept and Applications," *ACM TIST*, 2019.

[23] H. Greenspan et al., "Deep Learning in Medical Imaging," *IEEE Transactions on Medical Imaging*, 2016.

[24] M. Abadi et al., "TensorFlow: Large-Scale Machine Learning," 2016.

[25] A. Géron, *Hands-On Machine Learning with Scikit-Learn and TensorFlow*. O'Reilly Media, 2017.