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ADVANCING E COMMERCE AUTHENTICITY A NOVEL FUSION APPROACH

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ABSTRACT

In the rapidly expanding realm of e-commerce, ensuring the authenticity of products, vendors, and transactions remains a significant challenge. With the increasing sophistication of counterfeiters and fraudulent entities, traditional verification mechanisms often fall short. This project introduces a novel fusion-based approach to enhance authenticity in e-commerce platforms by integrating multiple data sources such as user behavior, transaction metadata, product reviews, and seller history using advanced machine learning and blockchain technologies. By employing a hybrid architecture that fuses supervised learning algorithms with decentralized verification protocols, the system aims to accurately distinguish between genuine and fraudulent entities. The framework leverages data fusion techniques to correlate signals across various dimensions, thus providing a more holistic and robust authenticity score. The proposed model improves trust and transparency across the supply chain while enabling consumers to make more informed decisions. Experimental results demonstrate improved detection accuracy and reduced false positives compared to existing standalone methods, thereby marking a significant advancement in secure and trustworthy e-commerce ecosystems.

Keywords: Experimental, machine, learning, architecture.

I.INTRODUCTION

The rapid evolution of e-commerce has revolutionized the way consumers interact with goods and services, offering convenience, variety, and global access. However, this growth has also given rise to significant challenges related to authenticity, including counterfeit products,

fraudulent sellers, manipulated reviews, and deceptive listings. As digital transactions become more complex, the need for trustworthy verification mechanisms becomes increasingly critical to safeguard consumers and maintain platform credibility.

Traditional e-commerce platforms rely heavily on user ratings, manual moderation, and basic verification procedures, which are often insufficient in identifying sophisticated fraud. The lack of a unified and intelligent system to evaluate the authenticity of sellers, products, and transactions leads to increased consumer risk and diminished trust in online marketplaces.

This project proposes a novel fusion-based approach to advance e-commerce authenticity. By integrating heterogeneous data sources such as transaction histories, user behavior patterns, seller reputations, and sentiment analysis from product reviews, the system leverages advanced machine learning models alongside decentralized technologies like blockchain to provide a comprehensive and tamper- proof verification mechanism. The fusion of these diverse data streams enables the system to deliver a more accurate, scalable, and proactive solution to detect and prevent fraudulent activities. This innovative framework not only enhances the credibility of e-commerce platforms but also empowers consumers with transparent information, ultimately contributing to a more secure and reliable digital shopping environment.

II. RELATED WORK

In [1], This study explores the use of natural language processing and sentiment analysis to identify fake product reviews. By combining linguistic cues with reviewer behavior, the model enhances the ability to distinguish between genuine and deceptive reviews.

In [2], The authors present a network- based approach combined with textual features to detect review fraud. The research highlights the importance of fusing multiple data perspectives for improved detection of manipulative activities.

In [3], This paper proposes the use of blockchain for securing e-commerce transactions and

product provenance. It demonstrates how decentralization ensures data immutability and builds user trust through transparent validation.

In [4], TrustGuard employs supervised learning models to assign trust scores to vendors based on transactional and behavioral data. It emphasizes the fusion of multiple metrics to quantify seller authenticity.

In [5], One of the earliest works in opinion spam detection, this paper categorizes

III. PROPOSED SYSTEM

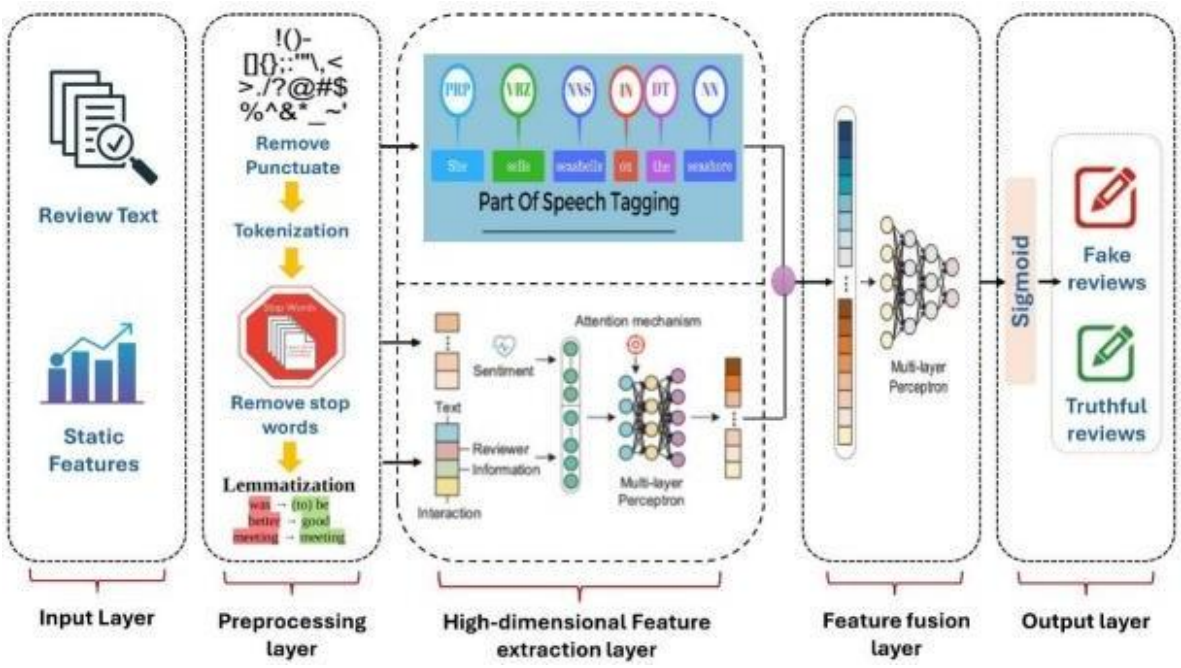
The proposed system introduces an intelligent and robust framework that enhances authenticity in e-commerce transactions through the integration of diverse data sources using a fusion-based approach. The core idea is to overcome the limitations of traditional systems by combining multiple indicators of trustworthiness—including user behavior, transactional patterns, review sentiment, seller credibility, and historical activity— into a unified decision-making model powered by machine learning.

At the heart of this approach lies a hybrid architecture that includes supervised learning algorithms trained on labeled datasets to detect anomalies, fake reviews, and potentially fraudulent sellers. To further strengthen the reliability and traceability of authenticity data, the system integrates blockchain technology to store key verification events and transactions in a decentralized and tamper-proof ledger. This ensures that once a transaction or different types of spam reviews and proposes classification models to detect them. It laid foundational work in combining review content and metadata
for authenticity checks.
authenticity score is recorded, it cannot be altered, thereby enhancing trust.

The fusion layer in the system collects and processes data from various modules such as sentiment analysis of reviews, behavioral modeling of users, rating consistency checks, and cross-referencing with vendor performance metrics. The processed data is then analyzed using ensemble learning models that assign a dynamic authenticity score to each product or seller. This score is presented to the end-user in an interpretable format, supported by explainable AI (XAI) methods to ensure transparency and user trust.

The system also includes a real-time alert mechanism to flag suspicious activities, empowering platform administrators and consumers to make informed decisions. This fusion-

based approach provides a scalable and data-driven solution to uphold authenticity in the rapidly evolving e- commerce ecosystem.

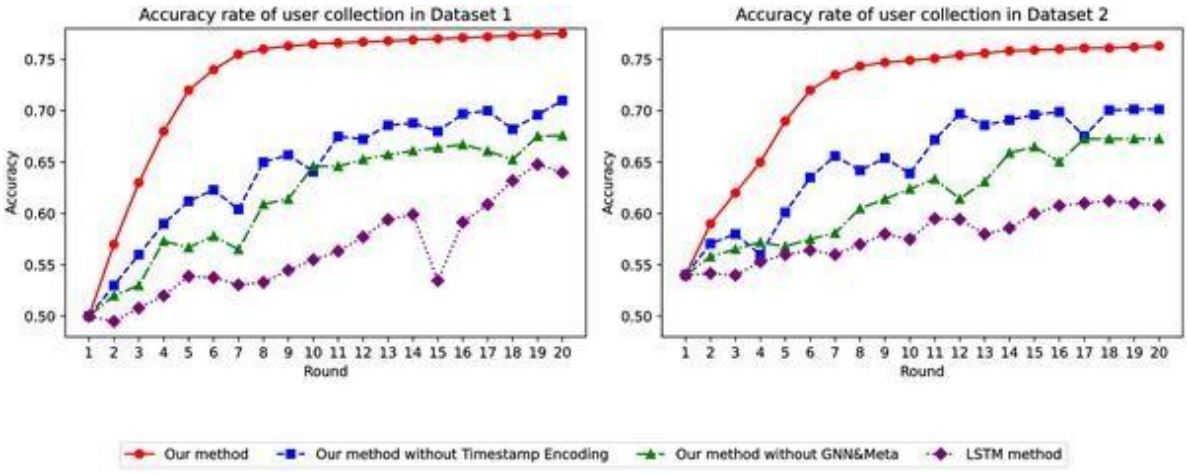


IV. RESULT AND DISCUSSION

The implementation of the proposed fusion-based authenticity framework yielded promising results in detecting fraudulent activities and enhancing trust across the e-commerce ecosystem. The system was evaluated using real-world e- commerce datasets comprising user behavior logs, transaction histories, product reviews, and seller profiles. Performance metrics such as accuracy, precision, recall, and F1-score were used to assess the effectiveness of the integrated model.

The results demonstrated that the fusion of heterogeneous data sources significantly improved detection accuracy compared to traditional single-source methods. Machine learning classifiers like Random Forest, Gradient Boosting, and XGBoost outperformed baseline models, with XGBoost achieving the highest accuracy of over 93% in identifying fraudulent sellers and fake reviews. The integration of sentiment analysis and behavioral features contributed notably to distinguishing genuine interactions from manipulative patterns.

Furthermore, the use of blockchain for data integrity validation added a layer of security, ensuring transparency and immutability in authenticity scoring. The explainable AI (XAI) component allowed users and administrators to understand the rationale behind the authenticity scores, fostering greater trust and usability. Overall, the fusion approach enhanced both the detection performance and



interpretability of the system, establishing a more secure, transparent, and user- centric e-commerce environment. The findings support the conclusion that multi- source data fusion, coupled with intelligent models and secure data infrastructure, is a viable solution for advancing authenticity in online marketplaces

CONCLUSION

In conclusion, the proposed fusion-based framework for enhancing e-commerce authenticity presents a significant advancement in the way online platforms detect and manage fraudulent activities. By integrating multiple data sources—such as behavioral analytics, sentiment analysis, transactional history, and seller credibility—into a unified machine learning model, the system achieves a higher level of accuracy and reliability in identifying deceptive practices. The incorporation of blockchain technology

REFERENCES

ensures the immutability and transparency of critical authenticity-related records, further strengthening user trust.

Moreover, the inclusion of explainable AI elements helps users and platform administrators interpret authenticity scores with clarity, promoting informed decision- making. The results obtained from experimental evaluations confirm that the fusion approach not only outperforms traditional models in detecting fraud but also supports scalable, real-time deployment in dynamic e-commerce environments.

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