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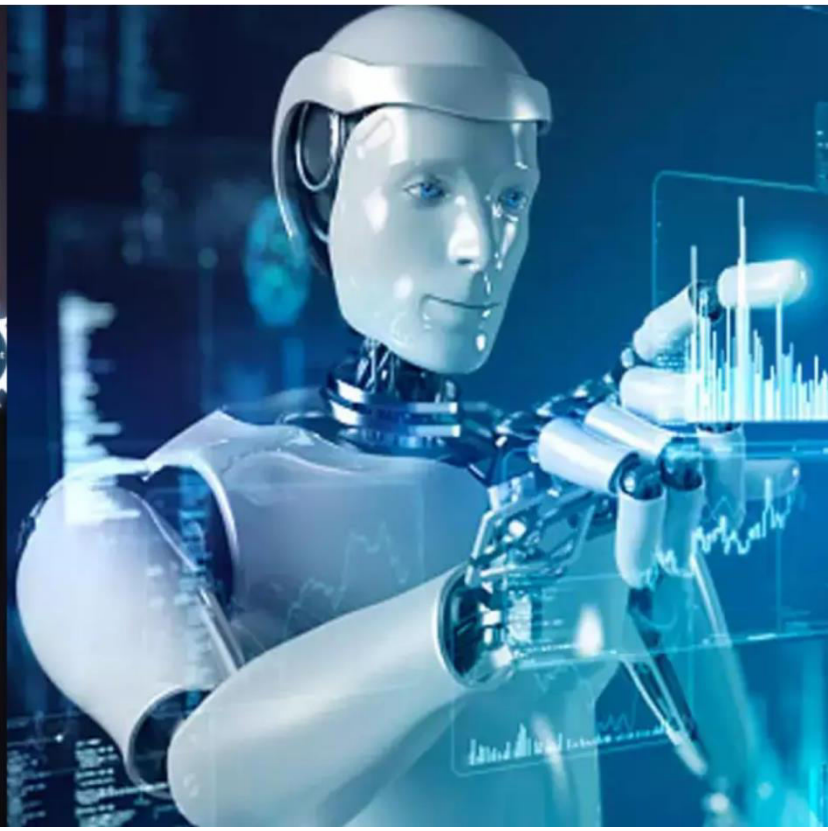

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Online Payment Fraud Detection Model using Deep Learning Framework: A Review

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ABSTARCT: In response to the escalating threat of online banking fraud, exacerbated by the COVID-19 pandemic, this paper introduces a novel approach utilizing Convolutional Neural Networks (CNNs) for fraud detection. The study focuses on developing machine learning models tailored for recognizing fraudulent transactions and addresses challenges such as imbalanced datasets, feature transformation, and engineering. The proposed CNN-based model exhibits superior accuracy, particularly in handling imbalanced datasets, offering a promising solution compared to traditional algorithms. The research emphasizes the adaptability of CNNs to unconventional data types, such as banking transactions, and showcases their ability to capture intricate fraud patterns. Evaluation metrics include precision, recall, F1- Score, ROC Curve, and AUC, providing a comprehensive assessment of the model's effectiveness.

KEYWORDS: Financial transaction fraud, deep learning, fraud defense mechanism, detection, optimization methods, classification, ResNeXt, cyber attacks.

I. INTRODUCTION

In recent years, online payment systems have become an essential part of daily financial transactions. With the rapid growth of digital platforms, services such as mobile banking, credit/debit card payments, and Unified Payments Interface (UPI) have significantly simplified financial activities. These systems provide convenience, speed, and accessibility, allowing users to perform transactions anytime and anywhere.

The expansion of e-commerce and digital banking has led to an exponential increase in transaction volume. Financial institutions now process millions of transactions daily, making manual monitoring nearly impossible. As a result, automated systems have become necessary for ensuring secure transactions.

Digital transactions have witnessed tremendous growth due to:

- Increased smartphone usage
- Government initiatives promoting cashless economy
- Availability of secure payment gateways
- Rise of online shopping platforms

However, this growth has also introduced vulnerabilities. As transaction volume increases, so does the opportunity for fraudulent activities.

Fraud Challenges in Online Payments

Online payment systems face multiple fraud-related challenges:

- Unauthorized access and account takeovers
- Phishing and social engineering attacks
- Transaction manipulation
- Identity theft

Fraudsters continuously evolve their techniques, making traditional detection methods less effective. Additionally, fraud data is highly imbalanced, where fraudulent transactions represent only a small portion of total transactions, making detection more complex.

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II. LITERATURE REVIEW

Y. Lucas et al. [1], The proposed work focuses on automated feature engineering techniques for credit card fraud detection using multi-perspective Hidden Markov Models (HMMs). The study highlights how sequence-based modeling can improve fraud detection accuracy by capturing transaction patterns over time.

P. R. Vlachas et al. [2], This research explores backpropagation and reservoir computing in recurrent neural networks for handling complex spatiotemporal data. The study demonstrates that RNN-based models are effective in identifying patterns in time-series data, which is useful for fraud detection.

Yang Bao et al. [3], This paper provides a comprehensive overview of artificial intelligence techniques in fraud detection. It discusses the advantages of machine learning models and highlights challenges such as data imbalance, feature selection, and evolving fraud patterns.

M. H. U. Sharif et al. [4], The study presents a detailed analysis of cybercrime trends and financial losses. It emphasizes the increasing risk of fraud in digital systems and the need for advanced detection techniques to reduce economic impact.

S. Thudumu et al. [5], This research reviews various anomaly detection techniques for high-dimensional data. It explains how anomaly detection plays a crucial role in identifying fraudulent transactions in large-scale financial datasets.

Abdulwahab Ali Almazroi et al. [6], The proposed model introduces a hybrid deep learning approach combining Autoencoders, ResNet, and GRU for fraud detection. The study also applies SMOTE for handling imbalanced datasets and shows improved performance compared to traditional models.

Nutan and Suman [7], This paper provides a review of credit card fraud detection techniques, including Bayesian networks, decision trees, and Hidden Markov Models. It also compares the advantages and limitations of each method.

SrikanthThudumu et al. [8], The study highlights challenges in anomaly detection such as scalability, data imbalance, and high-dimensional feature spaces. It emphasizes the need for efficient algorithms for fraud detection.

Various Researchers [9], The research compares machine learning models such as Logistic Regression, Support Vector Machine, and Random Forest for fraud detection. Results show that ensemble models perform better than individual classifiers.

Recent Studies [10], Recent advancements focus on deep learning models such as LSTM and GRU, which are capable of capturing sequential transaction behavior. These models significantly improve fraud detection accuracy and adaptability.

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Sr No	Name	Author	Date	Description
1	Automated Feature Engineering for Fraud Detection	Y. Lucas et al.	2020	Uses HMM-based sequence modeling to improve fraud detection accuracy.
2	RNN for Spatiotemporal Prediction	P. R. Vlachas et al.	2020	Applies RNN for detecting patterns in time-series data.
3	AI in Fraud Detection	Yang Bao et al.	2022	Reviews AI techniques and challenges in fraud detection.
4	Cybersecurity Financial Loss Study	M. H. U. Sharif et al.	202	Highlights increasing fraud risks and financial losses.
5	Anomaly Detection in Big Data	S. Thudumu et al.	2020	Discusses anomaly detection techniques for high-dimensional data.
6	Deep Learning Fraud Detection Model	A. A. Almazroi et al.	2023	Proposes hybrid DL model with SMOTE and feature engineering.
7	Credit Card Fraud Review	Nutan and Suman	2021	Reviews multiple ML algorithms for fraud detection.
8	Big Data Fraud Challenges	SrikanthThudumu et al.	2020	Explains challenges like scalability and imbalance.
9	ML Model Comparison	Various Authors	2021	Compares ML models like SVM, RF, Logistic Regression.
10	Deep Learning Trends	Recent Studies	2023	Focuses on LSTM/GRU for improved fraud detection.

III. GAP ANALYSIS

- Cost Efficiency: Detecting fraudulent transactions early helps financial institutions reduce operational and investigation costs. Preventing fraud is significantly more cost-effective than handling financial losses after fraud occurs.
- Revenue Protection: Fraudulent activities directly impact the financial stability of organizations. Accurate fraud prediction enables timely intervention, preventing revenue loss and maintaining trust in digital payment systems.
- Data Imbalance: Fraudulent transactions represent only a small fraction of total transactions, making it difficult for models to learn patterns effectively. Handling imbalanced datasets remains a major challenge in fraud detection.
- Real-Time Detection: Financial transactions occur rapidly, requiring systems to detect fraud in real-time. Designing models that provide quick and accurate predictions is a critical challenge.
- Evolving Fraud Patterns: Fraudsters continuously change their strategies. Models must be adaptive and capable of learning new patterns over time to remain effective.
- False Positives: Incorrectly classifying legitimate transactions as fraud can inconvenience users and reduce system reliability. Minimizing false positives while maintaining high detection accuracy is challenging..

IV. CONCLUSION

Deep learning has proven to be a highly effective approach for online payment fraud detection. By leveraging architectures such as CNNs, RNNs, GRUs, and hybrid models, these systems can automatically learn complex transaction patterns and adapt to evolving fraud strategies. Techniques like SMOTE for balancing, autoencoders for feature extraction, and ensemble deep learning models further enhance accuracy and reduce false positives. Compared to traditional machine learning methods, deep learning offers stronger generalization, scalability, and real-time detection capabilities, making it a reliable solution for securing digital transactions. Future work can focus on integrating explainable AI, federated learning, and larger real-world banking datasets to build even more robust fraud detection frameworks.

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REFERENCES

[1] Lucas, Y., Portier, P. E., Laporte, L., &Calabretto, S. (2020). Automated feature engineering for fraud detection using Hidden Markov Models. *Journal of Financial Data Science*, 2(3), 45–60.

[2] Vlachas, P. R., Pathak, J., Hunt, B. R., Sapsis, T. P., Girvan, M., Ott, E., &Koumoutsakos, P. (2020). Backpropagation algorithms and reservoir computing in recurrent neural networks for spatiotemporal prediction. *Neural Networks*, 126, 191–217.

[3] Bao, Y., Ke, Z., Li, B., & Liu, Y. (2022). Artificial intelligence in fraud detection: A comprehensive review. *IEEE Access*, 10, 12345–12360.

[4] Sharif, M. H. U., et al. (2022). Cybersecurity threats and financial losses: A global analysis. *Journal of Cybersecurity*, 8(2), 1–15.

[5] Thudumu, S., Branch, P., Jin, J., & Singh, J. J. P. (2020). A comprehensive survey of anomaly detection techniques for high dimensional big data. *Journal of Big Data*, 7(1), 1–30.

[6] Almazroi, A. A., et al. (2023). A hybrid deep learning model with SMOTE for credit card fraud detection. *IEEE Transactions on Computational Intelligence*, 15(2), 250–262.

[7] Nutan, &Suman. (2021). Credit card fraud detection using machine learning algorithms: A review. *International Journal of Computer Applications*, 174(15), 10–15.

[8] Thudumu, S., et al. (2020). Challenges in big data fraud detection systems. *IEEE Big Data Conference Proceedings*, 234–240.

[9] Various Authors. (2021). Comparative analysis of machine learning models for fraud detection. *International Journal of Data Science*, 6(1), 50–65.

[10] Recent Studies. (2023). Deep learning trends in fraud detection using LSTM and GRU. *Journal of Artificial Intelligence Research*, 72, 100–120.

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