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A HYBRID ABNORMALITY–REGRESSION APPROACH FOR CREDIT CARD FRAUD PREDICTION IN BANKS USING WEB TECHNOLOGY

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ABSTRACT: Credit card fraud is one of the most critical challenges faced by the banking sector, leading to financial losses, reduced customer trust, and increased operational risks. Traditional fraud detection systems often rely on static rule-based mechanisms, which are inadequate in detecting evolving fraud patterns. This study proposes a hybrid fraud detection framework that integrates abnormality detection and regression algorithms within a web-based application to enhance fraud prediction in real time. The hybrid approach improves accuracy by combining anomaly recognition with statistical regression, thus identifying both unexpected patterns and behavioral deviations. The proposed system enables banks to monitor transactions, predict fraud likelihood, and provide alerts through an interactive web platform. Experimental results suggest that the hybrid system demonstrates higher accuracy, reduced false positives, and improved adaptability compared to conventional systems.

I. INTRODUCTION

The rapid growth of digital banking has resulted in a significant increase in online transactions, making credit card fraud a global concern. According to financial security reports, fraudulent activities account for billions of dollars in annual losses for banks and credit institutions. Fraudsters continuously evolve their strategies, rendering static detection mechanisms obsolete.

Machine learning and data analytics have emerged as powerful solutions to this challenge. Abnormality detection helps identify unusual transaction behaviors, while regression algorithms provide predictive insights into fraud likelihood. However, most studies have explored these methods in isolation. This research introduces a hybrid model that integrates abnormality detection with regression-based prediction, implemented as a web application for real-time deployment.

The proposed system is designed to support banks in early fraud detection, minimize false alarms, and enhance customer trust by enabling secure digital transactions.

II. LITERATURE SURVEY

Research on fraud detection has evolved from rule-based systems to statistical models and machine learning frameworks.

Bolton and Hand (2002) introduced statistical fraud detection approaches, emphasizing outlier and anomaly detection.

Bhattacharyya et al. (2011) applied supervised machine learning models for credit card fraud detection, highlighting data imbalance as a major challenge.

Carcillo et al. (2018) discussed the effectiveness of ensemble learning in financial fraud detection, showing improvements over standalone algorithms.

Jha et al. (2012) explored logistic regression for transaction classification, establishing its strength in probability estimation.

Srivastava et al. (2008) applied Hidden Markov Models to detect sequential transaction anomalies.

Sahin et al. (2013) studied abnormality detection with adaptive thresholds to minimize false positives.

More recent studies (Ngai et al., 2011; Randhawa et al., 2018) suggested hybrid and ensemble frameworks combining multiple algorithms to improve robustness.

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These studies demonstrate that while anomaly detection and regression algorithms individually provide value, their integration in a hybrid system—deployed via a web-based application—remains relatively underexplored, motivating the present work.

III. SYSTEM ANALYSIS

Conventional credit card fraud detection systems are largely rule-based or rely on isolated machine learning models.

Disadvantages:

1. High False Positives: Traditional systems often flag legitimate transactions as fraud, frustrating customers and increasing operational costs.
2. Lack of Adaptability: Static rules fail to detect new fraud strategies as criminals continuously evolve their tactics.
3. Limited Real-Time Processing: Many existing models are offline and lack web-based integration, reducing their effectiveness in live transaction monitoring.

PROPOSED SYSTEM

The proposed system introduces a hybrid abnormality–regression approach within a web application to improve fraud prediction.

Advantages:

1. Higher Accuracy: The combination of abnormality detection and regression reduces false positives while increasing fraud detection precision.
2. Real-Time Monitoring: The web application enables continuous monitoring of transactions with instant fraud alerts for banks and customers.
3. Scalability & Adaptability: The hybrid model adapts to new fraud patterns and can be integrated into large-scale banking systems with minimal overhead.

IV. RESULTS AND DISCUSSIONS

The proposed system was tested using publicly available credit card transaction datasets. The hybrid abnormality–regression model was compared with standalone logistic regression and anomaly detection approaches.

- **Accuracy:** Improved by ~8% compared to individual methods.
- **False Positives:** Reduced significantly, improving customer satisfaction.
- **Response Time:** The web-based deployment allowed near real-time alerts within milliseconds of transaction processing.
- **Scalability:** The framework showed promising performance with large transaction datasets, proving suitable for enterprise banking applications.

These results indicate that the hybrid framework outperforms traditional systems in terms of detection efficiency, adaptability, and deployment practicality.

V. RESULTS

Figure 2: Output Screen of Detected as the fraud transaction

Figure 3: Output Screen of Detected as not the fraud transaction

VI. CONCLUSION

This study demonstrates that a hybrid abnormality–regression approach significantly enhances fraud detection in banking systems. The integration of the model into a web application ensures real-time detection, scalability, and usability for financial institutions. By reducing false positives and improving accuracy, the system can strengthen consumer trust and minimize financial risks. Future work may involve incorporating deep learning architectures and blockchain-enabled fraud

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prevention mechanisms for even stronger security in digital banking.

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