

ABSTRACT

The increasing popularity of e-commerce and reliance on various online payment systems have posed new challenging issues for consumers and financial institutions due to financial fraud. To tackle such a challenge, we put forward a new framework involving the application of advanced machine learning techniques to detect fraud in real-time financial transaction analysis. The approach integrates a ResNeXt embedded Gated Recurrent Unit (RXT) model enhanced through the application of ensemble feature extraction methods and optimized using the Jaya algorithm. Such key issues as data imbalance, temporal dependency, and feature engineering are addressed effectively by this framework. Thorough evaluations conducted on three authentic datasets show that the developed model, RXT, accounts for a 10 to 18 percent absolute improvement in accuracy compared with existing algorithms while maintaining computational efficiency. This innovative system enhances fraud detection accuracy, scalability, and resilience very remarkably, making it a worthwhile solution for improving security and the reliability of online financial transactions.