

Credit Card Fraud Detection Using Homomorphic Encryption Based On Unsupervised Anomaly Detection Network

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Credit card fraud has become a significant threat in the financial industry, with global losses reaching billions of dollars annually. As digital transactions increase in volume and complexity, traditional fraud detection systems struggle to keep pace with evolving fraud tactics. These existing systems rely primarily on supervised learning and are limited by the need for extensive labeled datasets and their inability to adapt to novel fraud patterns. This research proposes a novel approach to credit card fraud detection by integrating homomorphic encryption with an unsupervised anomaly detection network. The primary aim is to detect fraudulent transactions within encrypted data, thereby preserving user privacy while enhancing the adaptability and effectiveness of the fraud detection system. This study was conducted using a dataset comprising 900 credit card transactions, of which 450 were legitimate and 450 were fraudulent. The proposed model has achieved an accuracy of 96%, with a precision of 75% for legitimate transactions and 90% for fraudulent ones. The recall rates were similarly high, at 86% for legitimate transactions and 87% for fraudulent transactions. These results demonstrate the potential of the proposed approach to significantly improve fraud detection capabilities without compromising data security. This research highlights the importance of combining advanced cryptographic techniques with machine learning approaches to develop secure and effective fraud detection systems. The findings suggest that the proposed model can be used as a valuable tool in the fight against credit card fraud, offering both high accuracy and robust privacy protections.

Keywords: *anomaly detection, credit card, fraud detection, homomorphic encryption.*