

Transformer-Based Graph Neural Networks for RealTime Fraud Detection in Blockchain Networks

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Abstract: Blockchain transaction fraud detection is an essential issue as the technology gains greater acceptance within the financial domain. The conventional rule-based systems are no longer applicable to address emerging fraudulent schemes. To resolve these challenges, the paper suggests a new machine learning-based system to detect fraudulent actions of blockchain transactions. This paper discusses how high-level machine learning (ML) models can depict fraud through Ethereum transactional data. Comparing the features, the study of the work of Graph Neural Networks (GNN) and XGBoost. GNN is shown to have better classification performance with higher accuracy, recall, and ROC AUC and also less training time. GNN shows better results with the 98.40% accuracy rate and 0.997 ROC AUC, which are higher than other traditional classifiers like Logistic Regression (LR), LSTM (Long Short-Term Memory) and SVM (Support Vector Machine). The analysis of confused matrixes and ROC curve proves that the tool is quite strong to determine the presence of fraudulent behavior with the minimum of false negative results. This study highlights the possible potential of graph-based learning to secure blockchain-based ecosystems and enhance the process of detecting fraud.

Keywords: Cybersecurity, Blockchain Security, Ethereum, Fraud Detection, Transactional Data Analysis, Decentralized Finance (DeFi)